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Experimental and theoretical evaluation of N-pyridoxal-salicylic acid hydrazide derived copper(II) complex with 2-methylimidazole

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ABSTRACT

This article deals with the experimental and theoretical evaluations of N-pyridoxal-salicylic acid hydrazide (H_2pd-sah) **1** and its mixed-ligand copper(II) complex with 2-methylimidazole, [Cu(pd-sah)(MeImdH)] **2**. The compounds were characterized based on spectral (UV/Vis, IR) methods, powder-XRD, elemental analysis, and molar conductivity measurements. Both compounds' molecular structure and charge analysis were computed through B3LYP with 6-311 G (d, p) and LANL2DZ basic set using the Gaussian 09 W program package. The time-dependent density functional theory (TD-DFT) approach is used in gas-phase electronic transitions of **2** using the LANL2DZ basis set. Also, the computed UV-Vis based upon TD-DFT results and IR spectra were simulated for comparison with the experimental ones. The molecular structure based on theoretical investigation reveals that compound 2 adopts a distorted square planer N_2O_2 coordination sphere around the Cu(II). The ONO donor atoms of hydrazone moiety and one nitrogen of 2-methylimidazole constitute the N_2O_2 basal plane. Moreover, the in-vitro antioxidant activity was evaluated by DPPH assay in both compounds. In addition, Molecular docking studies were performed to predict the binding interaction between compound **2** and the Human Serum Albumin HSA (PDB ID: 1H9Z).

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Copper(II) complex; electrochemistry; DFT/HOMO–LUMO; NLO properties

1. Introduction

Schiff bases act as synthetic models in metalloproteins and metalloenzymes systems (Dürrenberger & Ward, 2014; Kumar et al., 2015). Various Schiff base classes can be constructed by the condensation of different types of primary amines with carbonyl compounds as they are widespread due to their miscellaneous chelating ability (Dhanaraj & Johnson, 2017). Many hydrazone derivatives Schiff bases are employed to treat diseases like tumours, tuberculosis, leprosy, and mental disorder (Raman et al., 2011). Imidazole and its derivatives have significant contributions that play a crucial role in the biological system (Pierre et al., 1995). The benzimidazole is the 5, 6-dimethyl derivative present in vitamin B_{12} and associated biomolecules (Sundberg & Martin, 1974). Besides, it has been reported that several copper complexes with benzimidazole derivatives show inhibitory effects on helminth parasites (Sanchez-Moreno et al., 1996). In the current research, significant focus areas involve copper bioinorganic chemistry, including their coordination and spectroscopic properties of prominent copper protein classes. Copper proteins have performed an enormous role in organic electron and oxygen transportation that involved a fantastic feat of interconversion of Cu(I) and Cu(II) and are crucial in facilitating iron uptake through binding to mucosal moving (Zhao et al., 2014). The biological utility of

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Synthesis, density functional theory, molecular docking and antioxidant studies of ruthenium(II) carbonyl complex of N-dehydroacetic acid-4-aminoantipyrene

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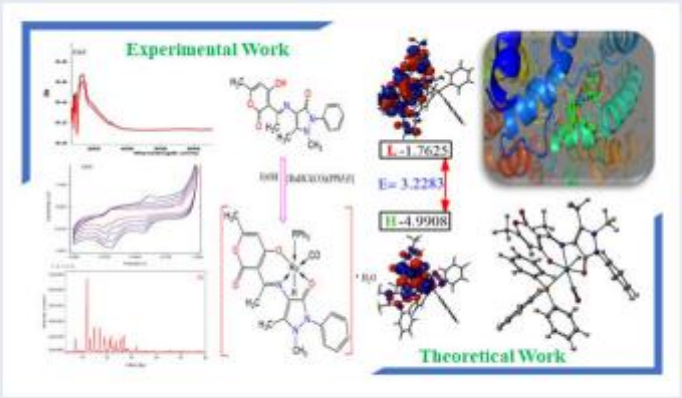
ABSTRACT

This manuscript deals with the combined experimental and theoretical investigations of *N*-dehydroaceticacid-4-aminoantipyrene (H_2dha-ap) (**1**) and [RuH(CO)(PPh_3)(dha-ap)]·H_2O (**2**). The treatment of N-dehydroacetic acid-4-aminoantipyrene with [RuHCl(CO)(PPh_3)$_3$] produced [RuH(CO)(PPh_3)(dha-ap)]·H_2O in good yield. The compound was characterized by elemental analysis, spectroscopic (IR, UV-vis, and ^{1}H NMR) methods, powder X-ray diffraction studies, and cyclic voltammetry. The molecular structure and charge analysis were examined through DFT. Molecular docking studies were performed to predict the binding between **2** and the receptor of SARS-CoV-2 (PDB ID: 6M0J). The *in vitro* antioxidant activity was evaluated by DPPH and NBT assays.



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KEYWORDS
Ru(II) carbonyl complex; molecular docking; antioxidant; DFT

1. Introduction

The carbonyl ligand with ruthenium complexes has attracted attention in antiviral, antitumor agents and deoxyribonucleic acid-binding agents [1, 2]. General co-ligands

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A Ruthenium(II) Nitrosyl Complex of *N*-Dehydroacetic Acid-Sulfadiazine: Synthesis, DFT Studies and *in silico* ADME Properties

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A sulpha drug-derived Schiff base ligand *N*-dehydroacetic acid-sulfadiazine was synthesized by treatment of dehydroacetic acid and sulfadiazine. A mononuclear Ru(II) nitrosyl complex of the Schiff base ligand *cis*-[$RuCl_2(NO)(PPh_3)$(dha-sdz)] was synthesized. The complex was characterized by spectral (IR, ^{1}H NMR and UV/visible) techniques and physico-chemical studies. A cyclic voltammetric technique observed the electrochemistry of the complex compound. Therefore, the Gaussian 09 programme has been used to optimized molecular structure, electronic surface analysis, NLO properties through DFT approaches *via* mixed basis set at B3LYP/LANL2DZ level of theory. The ^{1}H NMR spectrum of complex compound was computed with the GIAO method and correlated to experimental chemical shift. The TD-DFT based electronic absorption spectrum was computed using the PCM model. Additionally, the synthesized compound was predicting its *in silico* ADME properties, showing good physico-chemical and bioactivity. Finally, the *in vitro* antioxidant activity of the studied compound was monitored *via* two radical scavenging inhibitors.

Keywords: Ru(II) nitrosyl complex, FMOs, NLO, Antioxidant activity, ADME.

INTRODUCTION

Nitric oxide (NO•) is a highly reacting radical naturally formed by nitric oxide synthase (NOS), which plays a crucial role in various physiological processes such as blood regulation, neurotransmission, immune response, respiration and cytotoxic activity in tumour cells by apoptosis [1-3]. One area of intense investigation has been the reaction of NO at metal canters in several enzymes. Studies of NO reactivity with metal complexes have yielded important information about metal-NO chemistry. They have resulted in the metal-based NO-sensors and NO-scavenger technologies [4-7]. More recently, transition metal-NO complexes have been developed that act as NO donors by releasing coordinated NO upon exposure to light, which is of significant interest in the medical industry [8-10].

Ruthenium(II/III) complexes have unique and applied features. They are hexa-coordinated in said oxidation states, low spin and their substitution reaction rates are slighter than those of corresponding first row complexes. Ruthenium(II) can back-bonding [11,12], a milestone in coordination chemistry that led to a photochemistry and supramolecular chemistry; also, some of their complexes can iron mimic, a significant feature for biological characteristics [13]. The interaction of metal complexes with NO and metal nitrosyl complexes is crucial for synthesizing new NO donors and for NO scavenging activity [14,15]. Ruthenium complexes belong to an upcoming class of antitumour agents. Numerous unique ruthenium(II/III) complexes also exhibited the anticancer activity [16].

In absence of X-ray details in the current research outputs, molecular characterization is supported by computational investigations is considered for fruitful validation. Among DFT approaches is a robust theoretical technique to validate experimental evaluations [17]. Theoretical studies are essential to elucidate the fundamental properties and communicating extensive information about the physical and chemical properties of the compound. Density functional theory (DFT) in the computational chemistry has been established to apply chemical and biological science research. It has been used to predict and develop structural properties, vibrational spectral, and other spectral characterization of the micro and macro-molecules [18-24]. Molecular orbitals and the simulated electronic absorption spectrum may also be determined by the

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Original Paper

Adherence of *Aeromonas veronii*, *Shigella flexneri* and *Escherichia fergusonii* with *Microcystis*-dominated bloom relates to their ability to utilize chitin

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Abstract

The study was undertaken to size-fractionate the bacterial population associated with *Microcystis* blooms of an eutrophic lake. Two bacterial cultures were isolated from the particulate-bound fraction, and biochemical tests, phylogenetic analysis and homology of 16S rRNA gene sequences revealed their high similarity with A*eromonas veronii* and *Shigella flexneri*. Another isolate with characteristics resembling *Escherichia fergusonii* was obtained in phytoplankton-free water samples. Since these three cultures were enriched on chitin-selective medium, their capability to utilize chitin as a sole C source was examined. The *in vivo* chitinase activity (as µg *N*-acetyglucosamine produced min^{-1} mL^{-1} culture) was 82.1, 28.5 and 18.5 for *A. veronii*, *S. flexneri* and *E. fergusonii*, respectively. The corresponding *N*-acetylglucosamine accumulation in medium was 421, 288 and 122 µg mL^{-1}. There was also a gradation in growth indices in the three bacteria, which corresponded to their chitin utilization ability. Notwithstanding differences in chitinase activity, the three strains utilized almost equally the exogenous *N*-acetylglucosamine. We propose that chitinase activity may have a role in affinity of the particular bacterial cell to phytoplankton extracellular polymeric substances and therefore, adherence ability.

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Review Article

Short Chain Fatty Acids: Fundamental mediators of the gut-lung axis and their involvement in pulmonary diseases

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Evaluation of E-waste materials linked potential consequences to environment in India

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Isolation of bio-molecule Baicalein (5, 6, 7-Trihydroxy flavone) from root of Oroxylum indicum L. Vent and its prospective interaction with COVID-19 Viral S-Protein Receptor Binding Domain (AbstractView.aspx?PID=2022-15-11-34)

Author(s): Mamta Gokhale (search.aspx?key=Mamta Gokhale), Rumana Faraz (search.aspx?key=Rumana Faraz), Isha Deshpande (search.aspx?key=Isha Deshpande), Ashish Garg (search.aspx?key=Ashish Garg)

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Article

Effect of Various Growth Medium on the Physiology and *De Novo* Lipogenesis of a Freshwater Microalga *Scenedesmus rotundus*-MG910488 under Autotrophic Condition

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Abstract: The microalga *Scenedesmus rotundus*, isolated from Jabalpur, Madhya Pradesh, India was designated as *Scenedesmus rotundus*-MG910488 after morphological and molecular identification. In this study, the effects of various autotrophic growth media on the physiology and lipid accumulation of this microalga were investigated. The cell density, amount of photosynthetic pigments, the productivity of biomass and lipid content and the cell morphology of the microalga were shown to be significantly affected by the variation in growth media. The highest biomass of 754.56 ± 14.80 mg L^{-1} with biomass productivity of 37.73 ± 0.74 mg L^{-1} day^{-1} was achieved when this microalgae was cultivated in the Zarrouk's medium, whereas the highest lipid content of 33.30 ± 1.21% was observed in the BG-11 medium. The results confirm that the BG-11 is a cost-effective and efficient growth medium for this microalga. It also shows that the ingredients of the growth medium and its concentration influence the growth and synthesis of biomolecules produced by microalga. The biodiesel produced from obtained lipids was qualitatively estimated by Gas Chromatography-Mass Spectroscopy (GC-MS), Nuclear Magnetic Resonance (^{1}H, ^{13}C NMR) and Fourier Transform-Infrared Spectroscopy (FT-IR), which indicate the presence of oleic acid methyl ester, linoleic acid methyl ester and palmitic acid methyl ester as the leading fatty acid methyl esters (FAME) in the samples, which make this strain an ideal feedstock for biodiesel production.

Keywords: microalgae; growth media; lipids; pigments; biodiesel; GC-MS; NMR; FT-IR

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1. Introduction

Human society has an urgent need for liquid fuels, in a world which is almost entirely dependent on petroleum in the present scenario. Continued use of petroleum fuels is unsustainable due to depleting supplies, and they are the source of air pollutants that emit NO_2, CO, SO_2 and CO_2 gases. These gases show a hazardous impact on the environment, which results in global warming, ozone layer depletion, smog and acid rain. Furthermore, these gases also cause numerous health problems in humans, including asthma and cancer [1]. The environmental problems caused by the emission of harmful gases can only be eradicated by replacing petroleum fuel with an efficient and economically viable renewable and sustainable fuel such as biodiesel [2]. Bioenergy research involves finding a suitable feedstock to turn into biofuel, and discovering environmentally friendly, commercially feasible, long-term biodiesel and coproducts supplies [3]. Microalgae were analysed and found to be very useful for bioenergy production [4,5]. Microalgal biomass has emerged as an efficient alternative raw material for the production of biodiesel, reflecting its ability to

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Original Paper

Adherence of *Aeromonas veronii*, *Shigella flexneri* and *Escherichia fergusonii* with *Microcystis*-dominated bloom relates to their ability to utilize chitin

ISSN 2255-9582

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Abstract

The study was undertaken to size-fractionate the bacterial population associated with *Microcystis* blooms of an eutrophic lake. Two bacterial cultures were isolated from the particulate-bound fraction, and biochemical tests, phylogenetic analysis and homology of 16S rRNA gene sequences revealed their high similarity with A*eromonas veronii* and *Shigella flexneri*. Another isolate with characteristics resembling *Escherichia fergusonii* was obtained in phytoplankton-free water samples. Since these three cultures were enriched on chitin-selective medium, their capability to utilize chitin as a sole C source was examined. The *in vivo* chitinase activity (as µg *N*-acetyglucosamine produced min^{-1} mL^{-1} culture) was 82.1, 28.5 and 18.5 for *A. veronii*, *S. flexneri* and *E. fergusonii*, respectively. The corresponding *N*-acetylglucosamine accumulation in medium was 421, 288 and 122 µg mL^{-1}. There was also a gradation in growth indices in the three bacteria, which corresponded to their chitin utilization ability. Notwithstanding differences in chitinase activity, the three strains utilized almost equally the exogenous *N*-acetylglucosamine. We propose that chitinase activity may have a role in affinity of the particular bacterial cell to phytoplankton extracellular polymeric substances and therefore, adherence ability.

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SHORT COMMUNICATION

Comparative study of morphology and keratin levels in hair from deer and goat

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Abstract: Hair is a defining character of mammals. In the present study, the hair samples of Chital *Axis axis*, Sambar Deer *Rusa unicolor*, and goat *Capra hircus* were collected from the back, neck, abdomen and tail regions of carcasses brought to the forensic laboratory for necropsy examinations. Cross-sections of hair, cuticle scale, and medullary patterns were analyzed to establish indices for species identification. Keratin levels were also analyzed by protein electrophoresis (SDS-PAGE). We determined that both microscopic and SDS-PAGE analysis of guard hair is useful for identifying species, particularly in forensic applications.

Keywords: *Axis axis, Capra hircus,* domestic animals, guard hair, protein electrophoresis, *Rusa unicolor,* SDS-PAGE, wild herbivores.

Abbreviations: kDa–kilo Dalton | MALDI-TOF–matrix-assisted laser desorption/ionization–time of flight | PMF–peptide mass fingerprinting | SD–standard deviation | SDS-PAGE–sodium dodecyl sulphate

investigations related to wildlife, taxonomy, investigative dermatology, pathology, and other fields of forensic science (Sahajpal et al. 2009; Bahuguna et al. 2010). Guard hairs are usually procured for wildlife forensics, particularly species identification of wild animals (Tridico 2005; Knecht 2012). The hair has three internal parts: cuticle, cortex, and medulla, covered with a thin coating of derived proteins and tilted scales. Hair coloring is based on the presence of keratin protein in the hair cortex, scales of keratin overlapped by the cuticle layer (Deedrick & Koch 2004). The high content of cysteine and dead keratinocytes helps to protect the hairs from putrefaction and keep its chemical composition intact

Comparative analysis of wild and domestic carnivore animal hairs.

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Research Article

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Impact of ecDNA: A mechanism that directs tumorigenesis in cancer drug Resistance–A review

Sumel Ashique [1], Aakash Upadhyay [1], Ashish Garg [2], Neeraj Mishra [3], Afzal Hussain [4], Poonam Negi [5], Goh Bey Hing [6], Shvetank Bhatt [7], Md Khadem Ali [8], Kuppusamy Gowthamarajan [9], Sachin Kumar Singh [10], Gaurav Gupta [11], Dinesh Kumar Chellappan [12], Kamal Dua [13]

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Abstract

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Role of siRNA–based nanocarriers for the treatment of neurodegenerative diseases

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Abstract

Neurodegenerative disorders (NDs) lead to the progressive degeneration of the structural and physiological functions of the central and peripheral nervous systems, resulting in lifelong cognitive and motor dysfunction. Although comprehensive treatment of NDs is lacking, small interfering (si)RNA has shown therapeutic utility in the form of cellular nuclease-driven downregulation of mRNA levels. Various nanotechnologies have been used to modulate crucial physicochemical and biopharmaceutical properties of siRNA to provide protection and to enhance biomembrane interactions, residence times, tissue absorption, and cellular internalization for improved cytoplasm and/or nucleus interactions. In this review, we highlight advances in, and the role of, siRNA-based nanocarriers for the treatment of various NDs.

Keywords: Liposomes; Nanoparticles; Nanostructured lipid carriers; Neurodegenerative disorders; Small interfering RNA; Solid lipid nanoparticle.

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Journal of the Indian Chemical Society

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A novel tetrahedral silver complex of (*z*)-o-methyl s-hydrogen tosylcarbonimidothioate: DFT supported crystallographic and spectroscopic study

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Abstract

This article aims to discuss the synthesis and DFT-experimental formulation of a tetrahedral silver complex of (*z*)-o-methyl s-hydrogen tosylcarbonimidothioate. Spectroscopic and other analytical data reveal that the ligand behaves as monobasic unidentate ligand and reacts with Ag(I) core in 1:1 ratio to give diamagnetic complex of the general composition $[Ag(L)(PPh_3)_3]$, where LH denotes the ligand. The complex has been characterized using FT-IR, UV–Visible, mass spectral analyses and single X-ray crystallography in addition to other preliminary non-instrumental techniques. Also, the optimized framework of the proposed geometry has been confirmed from DFT calculations at LANL2DZ/B3LYP level of theory. The vibrational frequencies of the complex the corresponding normal modes were evaluated at the optimized geometry using the same basis sets followed by other required spectroscopic computation. From the results it is evident that the complex bears tetrahedral geometry with the tosyl ligand binding through S-anionic site.

Graphical abstract

DE GRUYTER

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NO, CO and H_2S based pharmaceuticals in the mission of vision (eye health): a comprehensive review

Jan Mohammad Mir, Ram Charitra Maurya and Mohd Washid Khan

From the journal Reviews in Inorganic Chemistry
https://doi.org/10.1515/revic-2021-0009

Abstract

A set of well defined signaling molecules responsible for normal functioning of human physiology including nitric oxide along with carbon monoxide and hydrogen sulphide are referred as "gasotransmitters". Due to their involvement in almost every system of a human body, the care of highly sensitive organs using these molecules as drugs represents highly fascinating area of research. In connection with these interesting aspects, the applied aspects of these gaseous molecules in maintaining healthy eye and vision have been targeted in this review. Several examples of eye-droppers including NORMs like latanoprost and nipradiol, CORMs like CORM-3 and CORM-A1, and Hydrogen sulfide releasing system like GYY4137 have been discussed in this context. Therefore the relation of these trio-gasotransmitters with the ophthalmic homeostasis on one hand, and de-infecting role on the other hand has been mainly highlighted. Some molecular systems capable of mimicking gasotransmitter action have also been introduced in connection with the titled theme.

Keywords: CORMs; H2S-donors; NORMs; ophthalmic diseases

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FOOD FRONTIERS

RESEARCH ARTICLE

Purification and characterization of phytase from *Bacillus subtilis* P6: Evaluation for probiotic potential for possible application in animal feed

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Abstract

The antinutritional property of phytate is the main problem associated with food animals, but phytase-producing probiotic strain could be the best alternative for resolving this problem. In the present study, phytase from probiotic strain *Bacillus subtilis* P6 was purified to homogeneity, which showed a relative molecular mass of 40 kDa on native and SDS-PAGE. The purification fold of purified phytase was 86.99, with a specific activity of 104.39 U/mg protein. The purified enzyme showed optimum activity at 40°C and pH 6.0. Semi-metal ions, such as K^+ and Ca^{2+}, slightly enhance the enzyme activity while Cu^{2+}, Co^{2+}, and Zn^{2+} prominently inhibited phytase activity. Purified phytase showed the highest substrate specificity toward its natural substrate phytate and did not hydrolyze other substrates having a phosphate bond. The purified enzyme exhibited strong proteolytic tolerance against trypsin and pepsin. Further, we evaluated the probiotic potential of *B. subtilis* and noted that it showed excellent resistance toward high acidic and bile concentrations. Subsequently, it revealed exceptional antimicrobial activity, good hydrophobicity, autoaggregation ability, nonhemolytic, and nonlecithinase activity. Additionally, *B. subtilis* P6 displayed susceptibility against major antibiotics. Owing to the excellent biochemical properties of phytase with notable probiotic characteristics, *B. subtilis* P6 may offer the possibility of being a promising candidate for the application in animal feed and food supplements. However, the in vivo use of strain secreting phytase needs to be studied in animals for its intended benefits

KEYWORDS
Bacillus subtilis, phytase, probiotic, purification, validation

1 | INTRODUCTION

Antibiotics are widely used in food animals for enhancing feed conversion and preventing microbial infection. However, the development of antibiotic resistance gene (e.g., CTX-M cluster 9 and blaTEM) and antibiotic residues (e.g., tetracycline, ampicillin, trimethoprim-sulfamethoxazole, streptomycin, spectinomycin, neomycin, and florfenicol) in animal-based products urges an urgent need for restriction on the use of antibiotics (Liu et al., 2020). The gastrointestinal tract (GIT) microbiota, including bacteria, archaea, and fungi, play a crucial

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A novel tetrahedral silver complex of (*z*)-o-methyl s-hydrogen tosylcarbonimidothioate: DFT supported crystallographic and spectroscopic study

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Abstract

This article aims to discuss the synthesis and DFT-experimental formulation of a tetrahedral silver complex of (*z*)-o-methyl s-hydrogen tosylcarbonimidothioate. Spectroscopic and other analytical data reveal that the ligand behaves as monobasic unidentate ligand and reacts with Ag(I) core in 1:1 ratio to give diamagnetic complex of the general composition $[Ag(L)(PPh_3)_3]$, where LH denotes the ligand. The complex has been characterized using FT-IR, UV–Visible, mass spectral analyses and single X-ray crystallography in addition to other preliminary non-instrumental techniques. Also, the optimized framework of the proposed geometry has been confirmed from DFT calculations at LANL2DZ/B3LYP level of theory. The vibrational frequencies of the complex the corresponding normal modes were evaluated at the optimized geometry using the same basis sets followed by other required spectroscopic computation. From the results it is evident that the complex bears tetrahedral geometry with the tosyl ligand binding through S-anionic site.

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From the journal Reviews in Inorganic Chemistry
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Abstract

A set of well defined signaling molecules responsible for normal functioning of human physiology including nitric oxide along with carbon monoxide and hydrogen sulphide are referred as "gasotransmitters". Due to their involvement in almost every system of a human body, the care of highly sensitive organs using these molecules as drugs represents highly fascinating area of research. In connection with these interesting aspects, the applied aspects of these gaseous molecules in maintaining healthy eye and vision have been targeted in this review. Several examples of eye-droppers including NORMs like latanoprost and nipradiol, CORMs like CORM-3 and CORM-A1, and Hydrogen sulfide releasing system like GYY4137 have been discussed in this context. Therefore the relation of these trio-gasotransmitters with the ophthalmic homeostasis on one hand, and de-infecting role on the other hand has been mainly highlighted. Some molecular systems capable of mimicking gasotransmitter action have also been introduced in connection with the titled theme.

Keywords: CORMs; H2S-donors; NORMs; ophthalmic diseases

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Effect of elevated temperature and carbon dioxide on grain quality of *Rabi* maize or winter maize cv. Raashi 4212

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Abstract

Rising levels of Co_2 and temperature are threatening global food security by affecting maize production and grain nutritional quality, one of the world's most important C4 cereal crop. The present investigatio reports the impact of climatic change on nutrient attributes of winter maize(Zea *mays* L.) by growing it in open top chambers (oTCs) with Ambient [A], Elevated temperature [ET], Elevated Co_2 [EC] and Elevated temperature+ Elevated Co_2 [ET+EC] during *Rabi* (November-February) seasons of 2016–18 at ICAR-DWR Jabalpur, India. Proximate composition of maize under the influence of climate change revealed change in the range of nutritive (Energy) value (375.96 to 392.69kcal/100g), carbohydrate (75.55 to 79.41%), moisture content (9.29 to 9.97%), total ash (1.40 to 1.49%), crude fiber (2.20 to 2.48%) crude fat (3.85 to 4.78%), crude protein (6.75 to 9.87%)and total nitrogen (1.08 to1.58%). The mineral content ranged for P, Mg, Fe, Ca, Na, K, Zn, S and Mn was 279.66–286.62 mg/100g, 136.88–147.12 mg/100g, 2.81–3.47 mg/100g, 174.77–180.95 mg/100g, 48.72–66.80 mg/100g, 275.94–286.75 mg/100g, 1.98–2.78 mg/100g, 115.95–118.44 mg/100g and 0.36–0.68 mg/100g, respectively. We expect it to be deeply useful to future studies, such as efforts to understand the impacts of elevated atmospheric Co_2, elevated temperature individually and in combination on crop macro- and micronutrient concentrations, or attempts to alleviate harmful effects of these changes for the billions of people who depend on these crops for essential nutrients.

Keywords

Elevated CO_2, Elevated temperature, Maize, Minerals, Nutrient concentration, Open top chambers (OTCs).

Bioresour Technol. 2022 Feb;346:126586. doi: 10.1016/j.biortech.2021.126586. Epub 2021 Dec 18.

Bioprocess potential of Eco-friendly fungal isolates converting organic waste to bioresource

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PMID: 34929330 DOI: 10.1016/j.biortech.2021.126586

Abstract

This study aims to present indigenous fungal diversity in the soil sample collected from solid waste disposal site. The synthesis of cellulase enzymes via in laboratory scale study has been performed using indigenous fungus isolates. Additionally; its impact has been evaluated on the basis of the bioconversion of organic waste treated employing screened potential cellulase producer fungi which

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Food Chemistry
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Analytical Methods

Dispersive liquid–liquid microextraction and diffuse reflectance-Fourier transform infrared spectroscopy for iodate determination in food grade salt and food samples

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Abstract

A novel method based on diffused reflectance Fourier-transform infrared spectroscopy (DRS-FTIR) was employed for iodate determination in food grade salt and food products. The method attained sensitivity that was comparable to or better than that in most of the contemporary spectrophotometric methods. This was realized through a combination of azo dye formation and dispersive liquid–liquid microextraction of

J Biomol Struct Dyn. 2022 Oct 11;1-44. doi: 10.1080/07391102.2022.2130984. Online ahead of print.

Screening of potential antiplasmodial agents targeting cysteine protease-Falcipain 2: a computational pipeline

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Abstract

The spread of antimalarial drug resistance is a substantial challenge in achieving global malaria elimination. Consequently, the identification of novel therapeutic candidates is a global health priority. Malaria parasite necessitates hemoglobin degradation for its survival, which is mediated by Falcipain 2 (FP2), a promising antimalarial target. In particular, FP2 is a key enzyme in the erythrocytic stage of the parasite's life cycle. Here, we report the screening of approved drugs listed in DrugBank using a computational pipeline that includes drug-likeness, toxicity assessments, oral toxicity evaluation, oral bioavailability, docking analysis, maximum common substructure (MCS) and molecular dynamics (MD) Simulations analysis to identify capable FP2 inhibitors, which are hence potential antiplasmodial agents. A total of 45 drugs were identified, which have positive drug-likeness, no toxic features and good bioavailability. Among these, six drugs showed good binding affinity towards FP2 compared to E64, an epoxide known to inhibit FP2. Notably, two of them, Cefalotin and Cefoxitin, shared the highest MCS with E64, which suggests that they possess similar biological activity as E64. In an investigation using MD for 100 ns, Cefalotin and Cefoxitin showed adequate protein compactness as well as satisfactory complex stability. Overall, these computational approach findings can be applied for designing and developing specific inhibitors or new antimalarial agents for the treatment of malaria infections.Communicated by Ramaswamy H. Sarma.

Keywords: Falcipain 2 (FP2); computational aided drug design (CADD); cysteine protease; maximum common substructure (MCS); molecular docking simulation.

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Research Article

Strategies to Improve the Anticancer Action of 5-Fluorouracil By Using Magnetically Targeted Drug Delivery Systems

Jyoti Choubey & A. K Bajpai

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ABSTRACT

In this study the iron oxide incorporated gelatin nanoparticles (IOIGNPS) were prepared following an emulsion crosslinking method employing genipin as a non-toxic crosslinking agent. The drug loaded nanoparticles were characterised by analytical techniques. Whereas the FTIR spectra confirmed the crosslinking of gelatin by genipin and encapsulation of the drug, the TEM analysis revealed the nanosize (up to 100 nm) of the nanoparticles. The magnetisation study suggested for the superparamagnetic nature of nanoparticles. It was found that the amount of released drug increases with increasing percent loading of 5-FU in the range 21.1%

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RESEARCH Open Access

Best proximity point results with their consequences and applications

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Abstract

In the commenced work, we establish some best proximity point results for multivalued generalized contractions on partially ordered complete metric spaces along with the tactic of altering distance function. Furthermore, we deliver some examples to elaborate and explain the usability of the attained results. To arouse further interest in the subject and to show its efficacy, we devote this work to recent applications of fractional calculus and also invoke our findings to the equation of motion modeling to differential equations.

MSC: 54H10; 54H25; 47H10

Keywords: Best proximity point; Partially ordered set; *F*-contraction; Metric space

1 Introduction and preliminaries

Estimating the solution of fixed point problems is well thought-out as one of the main problems in the metric fixed point theory. This forces the researchers to use the contractive conditions on underlying functions, to guarantee the existence of the fixed point. However, this issue becomes more interesting and challenging when mappings involved are non-self. This evolves the concept of best proximity point and related theorems. In fact a best proximity point theorem is principally dedicated to global minimization of the real-valued function $y \to \sigma(y, Sy)$, which measures the error involved for an approximate solution of the equation $Sy = y$ (fixed point problem). In other words, a best proximity point theorem expounds sufficient conditions for the existence of an element y such that the error $\sigma(y, Sy)$ is minimum. The more general version of best proximity point theorems having more than one non-self-mapping is known as common best proximity point theorems. In 2010, Basha [3] found a best proximity point with the help of the Banach contraction principle. Basha et al. [4] gave the existence of common best proximity points for pairs of non-self-mappings in metric spaces. Karapinar and Erhan [7] also studied best proximity for different types of contractions. Interestingly, these best proximity point theorems also serve as a natural generalization of fixed point theorems. If the mapping under consideration is a self-mapping, then a best proximity point becomes a fixed point. Note that one can convert optimization problems to the problem of finding the best proximity points. Hence, the existence of the best proximity points develops the theory of optimization. Through this theory, one can guarantee that a solution of the multi-objective global

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FOOD FRONTIERS

REVIEW ARTICLE

A review on phytochemicals, pharmacological activities, drug interactions, and associated toxicities of licorice (*Glycyrrhiza* sp.)

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Abstract

Since the beginning, human beings have consistently been using plants and their components for the prevention and treatment of various ailments. However, in the last few decades, plant-based medicines and health supplements are gaining more acceptability and rapid popularity. Licorice (*Glycyrrhiza* sp.) is a terrestrial herb belonging to the family Fabaceae and primarily cultivated in European, Middle Eastern, and South Asian countries. Ethnomedicinal uses of licorice have frequently been described in the world's renowned medical systems, including Ayurveda, Unani, Chinese, Korean, Japanese, African, and European traditional medical systems. To date, 30 species of licorice are known, and among them, *G. glabra*, *G. inflata*, and *G. uralensis* are significantly explored for nutritional and pharmacological benefits. The wide range of commercially available products, including herbal preparations, health supplements, cosmetics, and food and feeds preparations use licorice as active ingredient. Glabridin, licochalcone A, glycyrrhizin, and 18-glycyrrhetinic acid are the notable phytochemicals isolated from licorice and immensely explored for biological and pharmacological activities. Nevertheless, the excessive intake of licorice has also been associated with a wide spectrum of adverse effects on human health. Among them, several are reported to be mediated by modulation of drug-metabolizing cytochrome P-450 enzymes. In the present review, we provide a comprehensive description of the current knowledge of licorice, including historical development, phytoconstituents, species-specific marker metabolites, herb–drug interaction, pharmacological uses, food additive application, and toxicities. We believe this review will provide excellent information to physicians, researchers, and personnel of different scientific regulatory bodies.

KEYWORDS
food additive, glycyrrhetinic acid, glycyrrhizin, herb–drug interaction, marker metabolites, skin protector

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Role of diaminonaphthalene based polymers as sensors in detection of biomolecules: A review

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Keywords:
Poly(diaminonaphthalene)
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ABSTRACT

The recent advancements in the synthetic polymer chemistry have resulted in synthesis of potentially distinct conducting polymers that have found a wide range of applications from industry to biology. Among various conducting polymers, poly (diaminonaphthalene) (PDAN) and its derivatives have emerged as promising materials in constructing bio/chemical sensors and shown potential in quantitative and qualitative assays of a variety of bioactive molecules. It is, however, surprising that in spite of having unusual physicochemical properties of this typical polymer and its monomers, no comprehensive information about their sensing properties are available in the literature either as review articles or monographs. The present review article highlights a broad scenario of diaminonaphthalene (DAN) and its polymer-based nanostructured bio/chemical sensors providing insights into their functioning, structural composition, fabrication through various polymerization routes, and eventual applications in sensing different type of biochemically active molecules. Moreover, PDAN based Dual Gate Organic Field Effect Transistor has been modeled and substantially reviewed for their applications in sensing the biomolecules. The underlying present challenges in the area of PDAN based biochemical sensors and their future prospects have been critically examined and several issues to be addressed have also been raised.

1. Introduction

Today bio-and chemical sensors have delineated wide significance in the medical and environmental analyses as they find wide applications in sensing environmental changes, biological disturbances, food poisoning and processing, water contaminations, and diagnostic purposes of social and commercial relevance [1–5].The current pandemics, the COVID-19, makes the urgency of designing that type of biosensors which will help to test several differentiable deceases other than corona, so that doctors may adopt secured and fast clinical decisions. At the same time, point-of-care testing, reduced irrelevant mental fatigue, and medical expenses of the patient. According to the IUPAC body "Bio or chemical sensors are self-contained integrated devices, which are capable of providing specific quantitative or semi-quantitative analytical information using a biological and chemical recognition element (biochemical receptor), which are retained in direct spatial contact with a transducer element" [6].The overall performance of bio/chemical sensors greatly depends on the fundamental parameters like sensitivity, selectivity, biocompatibility, cost affordance and more importantly, the response time [7–10]. Furthermore, robustness, easy miniaturization and adaptation to extreme measuring environments are other factors that also contribute to the functioning and eventual performances.

There are available large number of conducting polymer (CP) based bio/chemical sensors which offer low cost, easy availability, biodegradability, portability and high sensing speed [11–15]. Moreover, biosensing detection mechanism is enhanced multiple by changing intrinsic properties of conducting polymer by doping nanomaterials which shows the interfacial cohesion between the active layers of CP and large surface area of doped nanoparticles [16,17]. Chromatographic separation, chiral separation, intermediation between sensing electrodes and drug screening are some of the fundamental properties of conducting polymers which enable themto function as bio/chemical sensors [18].The majority of conducting polymers possess an extended π conjugated backbone structure that allows stacking of specific molecules by a functional group and also detaches mobile charge carriers from the binding molecules [19].An extensive delocalization of unpaired electrons throughout the aromatic systems, especially inthe oxidizing states of polymers, enhances their conductivity up to the metallic range. Electrochemical properties of

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Review Article

Nanomaterials based biofuel cells: A review

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HIGHLIGHTS

- A comprehensive account of biofuel cells (BFCs) is presented.
- Various aspects of BFCs are critically analyzed.
- Role of nanomaterials in biofuel cells is emphasized.
- Current challenges in this field are mentioned.
- Future prospects are also highlighted.

GRAPHICAL ABSTRACT

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Energy

ABSTRACT

Biofuel cells (BFCs) are the devices made to transform the chemical energy of organic matter to electrical energy utilizing metabolic reactions occurring in microorganisma during degradation of organic contaminants. In spite of having many applications such as waste water treatment, biosensors and portable uses of BFCs, promoting the uses of BFCs is very challenging because of short life-time and low-power density. Most of the BFC developed till date is only capable to fulfill energy needs of biomedical short-term implanted devices. Use of materials with nano dimensions in the construction of BFCs has been studied extensively and reported as a worthwhile strategy to increase its efficiency. Usually, it is difficult to achieve efficient electron transfer on planar electrode from biocatalyst due to its non-specific orientational the interface. Nonmaterials provide close wiring for the electron transfer between biocatalyst and electrode. Use of various nanomaterials is the most effective way to decrease the gap between active sites (electron producing area)deep inside the enzyme or proteins and the electrodes to achieve better electron transfer. Also, various nanomaterials are utilized to improve the membrane materials for better electron barrier. Many carbon nanostructures, conducting polymers, metal and metal oxides are promising nonmaterials to enhance the current output from BFC. This review highlights recent progress registered in the development of various

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Genetic diversity and expression profile of Plasmodium falciparum Pf34 gene supports its immunogenicity

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PMID: 34425378 DOI: 10.1016/j.retram.2021.103308

Abstract

Purpose of the study: Genetic variation is one of the major obstacles in the development of effective vaccines. A multivalent malaria vaccine is required to increase efficacy and confer long term protection. In this context, we analysed the genetic diversity, expression profile, and immune response against Pf34.

Methods: Phylogenetic analysis was carried out using Pf34 orthologues sequences of various Plasmodium species. Genetic diversity was analysed by PCR amplification and Sanger dideoxy sequencing of Pf34 gene from Plasmodium falciparum positive human blood samples. The expression level of Pf34 gene was studied during erythrocytic stage by real time qPCR at four-hour interval, and immune response against synthetic peptides of Pf34 (P1 and P2) was analysed using ELISA.

Results: Phylogenetic analysis revealed the conserved nature of Pf34 gene. Genetic diversity analysis showed that majority (92%) of Plasmodium falciparum isolates in available database bore wild type Pf34 gene (Hd = 0.160 ± 0.030, π = 0.00021), including the present study (89.3%). The P. falciparum specific amino acid repeats (NNDK, NNDLK, and NNNNNN) in the B cell epitope regions were conserved. Furthermore, Pf34 gene is expressed throughout the erythrocytic cycle and comparatively high expression was observed in early ring and schizont stage. High IgG response was observed against both the peptides P1 and P2 of Pf34 containing asparagine NNNNNN and NNDLK repeat respectively.

Conclusion: The limited genetic diversity, presence of conserved amino acid repeats within B cell epitope and high IgG response suggests that Pf34 may be a potential vaccine candidate for malaria. However, further validation studies are required.

Keywords: Amino acid repeat; Expression; Genetic diversity; Pf34; Plasmodium falciparum.

Related information

MedGen

Published: 15 July 2021

Design of Fractional Calculus based differentiator for edge detection in color images

Santosh Kumar Mishra, Koushlendra Kumar Singh, Richa Dixit & Manish Kumar Bajpai

Multimedia Tools and Applications **80**, 29965–29983 (2021)

Abstract

Edge detection has many applications in engineering and medical field. Edge detection in color images is getting the attention of the researchers due to the reason that color images have more information as compared to gray scale images. Different differential methods have been proposed in the literature for edge detection. Some of them required smoothing due to high sensitivity of differential methods towards noise. In the present manuscript, fractional order differentiation operator is defined to find out the gradient of the image which is further used for edge detection. Considering the input image as a reconstructed image, optimal threshold selection method is defined which is based on an error in image reconstruction assuming thatthe input image isa

erature for edge detection. Some of them required smoothing

Original Paper | Published: 02 April 2021

Extraction strategies of PAHs from grilled meat for their determination by HPLC–DAD

Nisha Sharma, Archana Jain & Krishna K. Verma

Chemical Papers **75**, 3859–3871 (2021)

Abstract

Strategies have been used in this work for rapid and precise extraction of polycyclic aromatic hydrocarbons (PAHs) from grilled meat. Samples were pre-extracted with acetonitrile/potassium hydroxide under microwave irradiation, and after dilution with water subjected to two alternative pre-concentration and clean-up methods. In the first method, the extract was treated with hydrophilic deep eutectic solvent (DES) of choline chloride:phenol (1:2, molar ratio), and the extract phase separated by salt-assisted liquid–liquid extraction (SALLE) with acetonitrile. This method was found better than the conventionally used emulsification with tetrahydrofuran. In the other method, a methanolic solution of 1,4-dichlorobenzene (DCB) was injected into the extract when a cloudy solution was obtained due to

Natural Products: From Chemistry to Pharmacology (C Ho, Section Editor)
Published: 10 August 2021

Endophytic Mycoflora: Antibacterial Secondary Metabolites and Their Therapeutic Potential

Ravindra Prasad Aharwal, Suneel Kumar & Sardul Singh Sandhu

Current Pharmacology Reports **7**, 150–170 (2021)

Abstract

Purpose of Review

Nowadays, the need of novel biological active compounds is growing as there is remarkable increase in antibiotic resistance developed in microbes. In the present time, the need of new active novel biological molecules is growing as there is remarkable increase in antibiotic resistance. Therefore, the main purpose of this review articles is to introduce endophytic mycoflora that play important role in production of secondary metabolites of pharmaceutical and agriculture interest that fight against various bacterial infections and diseases.

Recent Findings

Original Paper | Published: 18 July 2021

Production of green electricity from *Cynodon dactylon* in plant-bio-photovoltaic device

A. K. Jawre & S. S. Sandhu

International Journal of Environmental Science and Technology **19**, 5623–5630 (2022)

Abstract

The bio-photovoltaic device is the bioelectrochemical system that uses living plants and soil electrogenic bacteria, i.e. rhizosphere biota is present for the production of green electricity. The basic fundamental is that living plants are banishing rhizodeposits from roots in terms of green electricity, which soil rhizosphere microorganisms are decomposition of organic matter that moves energy-rich electrons to an electrode can be changed to electrical energy and which the electrons combine with the oxygen at other electrodes to form water. The configuration of bio-photovoltaic device was made up of a single-chamber device in the plastic container. Here, in these experiments, *Cynodon dactylon* (grass) contained anode (aluminium) site in the rhizosphere region while another cathode (copper)

Microbial Rejuvenation of Polluted Environment pp 247–261

Microbes: A Novel Source of Bioremediation for Degradation of Hydrocarbons

Mridul Shakya, Poonam Verma, Sunil Kumar & Sardul Singh Sandhu

Chapter | First Online: 16 January 2021

538 Accesses

Part of the Microorganisms for Sustainability book series (MICRO,volume 25)

Abstract

In our daily life, the demand for liquid petroleum products is increasing day by day. Crude oil-derived hydrocarbons, the largest group of environmental pollutants found worldwide, pollute our environments severely. Oil or hydrocarbons cause drastic impacts on living organisms. The many reports about their toxicity emphasize the ultimate need to remove them from marine and terrestrial environments. For cleaning up pollution by these hydrocarbons, bioremediation seems to be the

Microbial Rejuvenation of Polluted Environment pp 153–184

VAM: An Alternate Strategy for Bioremediation of Polluted Environment

Poonam Verma, Suneel Kumar, Mridul Shakya & Sardul Singh Sandhu

Chapter | First Online: 16 January 2021

Part of the Microorganisms for Sustainability book series (MICRO,volume 25)

Abstract

Soil remediation is a term that involves a numerous processes designed to get rid of contaminants like hydrocarbons (petroleum and fuel residues), heavy metals, pesticides, cyanides, volatiles, or semi-volatiles from soil. Remediation is required to control the pollution in soil, water, and air that can consequently benefit commercial cultivation or for wild flora and fauna. AM fungi are ubiquitous in soil habitat and form beneficial symbiosis with the roots of angiosperms and other plants. Their life cycle is

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INTUITIONISTIC FUZZY SEMI δ-PREOPEN SETS AND INTUITIONISTIC FUZZY SEMI δ-PRECONTINUITY

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Abstract. The purpose of this paper is to introduce the concepts of fuzzy semi δ-preopen sets and fuzzy semi δ-precontinuous mappings in intuitionistic fuzzy topological spaces and obtain some of their properties and characterizations.

Key words and Phrases: Intuitionistic fuzzy set, Intuitionistic fuzzy topology, Intuitionistic fuzzy semi δ-preopen sets and Intuitionistic fuzzy semi δ-precontinuity

1. INTRODUCTION

The concept of fuzzy sets was introduced by Zadeh [26]. Using the concept of fuzzy set Chang [2] introduced the concept of fuzzy topological spaces.

In 1986, Atanassov [1] introduced the concept of intuitionistic fuzzy sets as a generalization of fuzzy setss. In 1997, Coker [5] introduced the concepts of intuitionistic fuzzy topological spaces as a generalization of fuzzy topological spaces. After the introduction of intuitionistic fuzzy topology by Coker [5], many mathematicians such as Eom and Lee [7], Hanafy [9, 10], Jeon [11], Coker and his associates [8, 3, 24], Thakur and his associates [17, 18, 19, 20, 21, 22] and Lupianez [13, 14, 15, 16] have been extended various fuzzy topological concepts in intuitionistic fuzzy topology.

In the present paper, we introduced the concept of intuitionistic fuzzy semi δ-preopen sets and intuitionistic fuzzy semi δ-precontinuous mappings and study some of the basic properties.

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A review on morphological studies of phosphors by combustion route synthesis: The role of fuels

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Abstract. There are several methods are developed for the synthesis of phosphor materials with different advantages like short reaction time and crystal lattice parameters. Solution combustion synthesis is one of the novel method for the synthesis of phosphor materials. In past few years, Solution combustion method has been used to develop novel nanostructured phosphor materials although there is special attention has been given to the morphological studies of the luminescent phosphors. Different kinds of fuels were employed for the synthesis of luminescent phosphor using fues like triethylamine, analine, urea, citric acid and hydrazine. This review focuses on the recent work on the phosphors prepared by solution combustion using different types of fuels.
Keywords: Combustion synthesis; phosphor; fuels; morphology; nanomaterials.

1. Introduction

Solution combustion synthesis paid its attention in the field of luminescence for their different morphological behavior depending on the fuel used in the synthesis[1–5]. Among different luminescent materials synthesized by combustion synthesis are broadly utilized in the new generation of lighting systems[6,7]. For instance the phosphors utilized in the lighting systems has specific characteristics like thermal conductivity, high resolution etc. Few outstanding investigations on the nano sized phosphors synthesized by combustion route has been studied and applied on the luminescent properties which shows its worth in applications of white light emitting diodes[8–12]. Although synthesizing nanoscale luminescent materials will improve the quality of characteristics of the white light emitting diodes.

Aluminate based phosphors has been majorly investigated by the researchers for luminescent properties[13–15]. Aluminate phosphors Shows their superior characteristics among the recently investigated luminescent phosphors like high melting point, resistance properties and high strength at high temperature. Moreover it shows few more important characteristics like transparent materials, humidity sensors, solid state lightings and so on. There is several different synthesis techniques are reported for the preparation of aluminate based phosphors like sol-gel method, co-precipitation technique, wet chemical method, combustion technique, solid state diffusion method etc. Combustion synthesis is one of the most novel synthesis method among all the chemical route synthesis because of its easy preparation technique, suitable processing and time saving quality which shows unique characteristics of LEDs like color purity, high quantum efficiency. Phosphor

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Ligand Decorated Primaquine Loaded Nanocarriers for Liver Targeting for Triggered Anti-Malarial Activity

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Abstract

Objective: The aim of the current research is to formulate a nano delivery system for effective delivery of primaquine for liver targeting to achieve the potential anti-malarial activity. Another objective of current development is to formulate a lactobionic acid conjugated polyphosphazene based nano delivery of primaquine for liver targeting to distinguish anti-malarial activity.

Method: The particle size, entrapment efficiency, in-vitro drug release pattern, hepatotoxicity, MTT assay, erythrocyte toxicity assay, histopathology study, HepG2 cell uptake study, anti-- malarial study, and organ-distribution was also carried out to estimate the activity and potential features of a nanoparticle system.

Results: The results obtained from the above analysis justify the efficiency and effectiveness of the system. The NMR studies confirm the conjugation pattern and the TEM represents the spherical morphological features of nanoparticles. The controlled release pattern from the in-vitro release study was observed and found to be 73.25% of drug release in 20 hrs and in the nano-size range (61.6± 1.56 nm) by particle size analysis.SGOT level, SGPT, ALP, and Parasitemia level of optimized drug-loaded PEGylated lactobionic acid conjugated polyphosphazene derivatized nanoparticles (FF) was found to lie in the safe range, showing that the formulation is non-toxic to the liver. Primaquine drug-loaded PEGylated lactobionic acid conjugated polyphosphazene polymeric nanoparticles showed higher cell uptake on HepG2 cell lines as compared to the drug-loaded in PEGylated polyphosphazene polymeric nanoparticles and plain drug.Percentage cell viability of drugloaded PEGylated lactobionic acid conjugated polyphosphazene derivatized nanoparticles was decreased by enhancing the concentration of prepared nanoparticle system accessed by MTT assay.

Conclusion: From the studies, it can be concluded that the optimized formulation of drug-loaded PEGylated lactobionic acid conjugated polyphosphazene derivatized nanoparticles showed high liver targeting, least toxicity to the liver, controlled release of the drug, higher anti-malarial activity against hepatocytes at a low dose, more effectiveness, and can be treated as a potential candidate for anti-malarial therapy.

Keywords: Nanoparticles; hepatotoxicity; histopathology.; lactobionic acid; malaria; organ distribution; primaquine.

Related information

overnment Pharmacy Institute, Agamkuan, Patna, India.

Vet World. 2021 May;14(5):1093-1101. doi: 10.14202/vetworld.2021.1093-1101. Epub 2021 May 6.

Effects of different concentration of organic and inorganic trace minerals (zinc, selenium, and chromium) supplementation on expression of chTLR4 gene and humoral immune response in broilers

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Free PMC article

Abstract

Background and aim: Poultry production is the fastest-growing livestock sector in developing countries. In the poultry diet, trace minerals (zinc [Zn], selenium [Se], and chromium [Cr]) are normally administered in the inorganic form which has been traditionally considered as the most cost-effective and easily available but organic forms of these trace minerals have a higher bioavailability, lower dietary inclusion and cause less environmental pollution as compared to inorganic form. This study aimed to investigate the effect of different concentrations of organic and inorganic forms of trace minerals (Zn, Se, and Cr) supplementation (0-35 days) on expression of chTLR4gene and humoral immune response in broilers.

Materials and methods: A total of 216 broilers were randomly divided into 12 groups and each group divided into three replicates consisting of six broilers each. T1 (R1, R2, and R3) group was kept as control. T2, T3, and T4 (R1, R2, and R3) groups were supplemented with inorganic form of Zn at 40 mg/kg of feed, organic form of Zn at 40 mg/kg of feed, and 50% organic form of Zn at 20 mg/kg of feed, respectively. T5, T6, and T7 (R1, R2, and R3) groups were supplemented with inorganic form of Se at 0.3 mg/kg of feed, organic form of Se at 0.3 mg/kg of feed, and 50% organic form of Se at 0.15 mg/kg of feed, respectively. T8, T9, and T10 (R1, R2, and R3) groups were supplemented with inorganic form of Cr at 2 mg/kg of feed, organic form of Cr at 2 mg/kg of feed, and 50% organic form of Cr at 1 mg/kg of feed, respectively. T11 and T12 (R1, R2, and R3) groups were supplemented with a combination of all three minerals from inorganic and organic forms, respectively.

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A Nonclinical Spectroscopic Approach for Diagnosing Covid-19: A Concise Perspective

J. M. Mir, M. W. Khan, A. H. Shalla & R. C. Maurya

Journal of Applied Spectroscopy **88**, 765–771 (2021)

With the COVID-19 outbreak, many challenges are posed before the scientific world to curb this pandemic. The diagnostic testing, treatment, and vaccine development for this infection caught the scientific community's immediate attention. Currently, despite the global proliferation of COVID-19 vaccination, the specific treatment for this disease is yet unknown. Meanwhile, COVID-19 detection or diagnosis using polymerase chain reaction (PCR)-based me hods is expensive and less reliable. Moreover, this technique needs much time to furnish the results. Thus, the elaboration of a highly sensitive and fast method of COVID-19 diagnostics is of great importance. The spectroscopic approach is herein suggested as an efficient detection methodology for COVID-19

12

Nitric Oxide, Carbon Monoxide, and Hydrogen Sulfide as Biologically Important Signaling Molecules With the Significance of Their Respective Donors in Ophthalmic Diseases

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Abstract

Nitric oxide (NO) along with carbon monoxide (CO) and hydrogen sulfide (H_2S) are biologically significant gaseous molecules generally called as "gasotransmitters". At a concentration higher or lower than optimum value may result in toxicity or malfunctioning of mammalian tissues. Soon after the acknowledgment of NO as multifunctional bio-signaling molecule in 1987, many interesting implications of this field emerged out. Meanwhile, several studies have proven the NO-biosynthetic pathway responsible for normal functioning of eye. High intraocular pressure (IOP) has been suggested as the main risk factor in this context, and collaborative approach with NO releasers is said to control IOP and hence the relation with glaucoma. Similar miracles were reflected from several other naturally produced gaseous molecules, *viz.*, CO and H_2S after year 1990. The biological roles of both these molecules are now widely accepted and in the current era investigations focused mainly with development of efficient CO and H_2S releasing compounds. CO and H_2S donors are also said to help in normalising IOP like NO. Therefore, the trio-gasotransmitters have collective relation with the ophthalmic homeostasis in association with nervous control. On one hand, the antimicrobial

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ADITUM

Journal of Ophthalmology and Vision Care

Open Access

Mini Review

Biochemical tale of CO in the vale of eye: a mini review

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Abstract

Carbon monoxide (CO) is one of the biologically significant members of "gasotransmitters" known to have multiple roles in maintaining mammalian homeostasis. This molecule at non-optimal level is toxic for mammalian physiology. Like nitric oxide, this gaseous molecule found associated with metabolic pathways of heme-oxygenase, has profound implications on maintaining healthy eyesight. CO donors or CO-releasing molecules have also sound applications in normalizing Intra Ocular Pressure (IOP). Therefore, the CO is related with the ophthalmic control. In addition to rectify optical defects the antimicrobial efficiency of CO and its releasers represent fascinating area of research. Hence, the related compounds are supposed to act as a shield for both the infectious as well as the non-infectious eye defects.

Keywords: Gasotransmitters; Ophthalmic diseases; CO; CORMs.

1. Introduction:

The scientific recognition of carbon monoxide (CO) and hydrogen sulphide (H_2S) as bio-conjugated molecules sharing similar functional role as nitric oxide (NO) resultedin coining the term "gasotransmitters" for these molecules based on size, lipophilic character,half-life and several other features [1, 2].Even though these gases share a number of common features, they also possess dissimilar characteristics and display noteworthy interactions, which complicate the interpretation of their physiological activities.

Carbon monoxide (CO) has long been known as a dangerous gas for mammals and is called as a "silent killer" [3]. Carbon monoxide, when inhaled enters the bloodstream, formscarboxyhaemoglobin (COHb) at a rate 240 times greater than oxygen [4]. This reduces the oxygen transport ability and results in hypoxia [5]. Biologically, CO is considered as a by-product of heme oxygenase (HO) metabolism [6], and in the early stage of its biological exploration, CO was found as a chronic neurotransmitting agent [7]. Therefore, the further studies have altered the general perception of CO as a harmful molecule [8]. CO has now become an important molecule in the physical monitoring of many organ systems. In the last few decades, investigations related to CO have shown this gaseous molecule as a major chemical messenger.

The eye is one of the most sensitive parts of the brain. Any impairment in eye function requires high quality care. Among eye health problems intraocular pressure (IOP), cataract and retinal hypertension continue to remain as potential risk factors in treatment. Due to our growing interest towards pharmaceutical aspects of NO, CO and H_2S –based systems [9-17], and also, due to profound bio-actions of CO-tagged compounds on eye, herein a mini review in connection with CO-role in eye is reported. A historical view of the emergence of the term "gasotransmitter", within the production of CO in mammals, and to seek strong sponsors of CORMS (in the event of chronic biosynthesis and digestion) applicable in the most common eye-defects are the main objectives of this literature update.

2.Concept of "Gasotransmitters":

In general, gasotransmitters refer to the distinctive class of molecules like NO, CO and H_2S, responsible for communication amongst body cells for a particular biological action. Albeit, these molecules exist in solvated form while in biological medium, the

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Natural Products: From Chemistry to Pharmacology (C Ho, Section Editor)
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Bioactive Molecules of Endophytic Fungi and Their Potential in Anticancer Drug Development

Suneel Kumar, Ravindra Prasad Aharwal, Roshni Jain & Sardul Singh Sandhu

Current Pharmacology Reports **7**, 27–41 (2021)

Abstract

Purpose of Review

Endophytes such as bacteria, fungi and actinomycetes are play significant role in the production of bioactive metabolites and plant defence mechanisms. These endophytes develop asymptomatically in the inner tissues and cells of the host plant without causing any symptoms. But studies are ongoing on endophytic fungi, since many of the mycoflora endophytes are unstudied as well as widespread and highly diverse. Endophytic fungi are a large source of different types of metabolites that can be used for the treatment of various types of diseases and manufacture of drugs in the pharmaceutical industries. Recent studies have shown that endophytic fungi, through their

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Role of diaminonaphthalene based polymers as sensors in detection of biomolecules: A review

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Highlights

- The present article presents a critical review of the current scenario of diaminonaphthalene and its polymers.
- The review article summarizes the role of diaminonaphthalene and its polymers as sensors for biomolecules.
- Various analytical techniques of detection have been discussed.

Abstract

The recent advancements in the synthetic polymer chemistry have resulted in synthesis of potentially distinct conducting polymers that have found a wide range of applications from industry to biology. Among various conducting polymers, poly (diaminonaphthalene) (PDAN) and its derivatives have emerged as promising materials in constructing bio/chemical sensors and shown potential in quantitative and qualitative assays of a variety of bioactive molecules. It is, however, surprising that in spite of having

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HYPOTHESIS PAPER

Nitric oxide boosters as defensive agents against COVID-19 infection: an opinion

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Communicated by Ramaswamy H. Sarma

ABSTRACT

In the prevailing covid times, scientific community is busy in developing vaccine against COVID-19. Under such fascination this article describes the possible role of nitric oxide (NO) releasers in aiding the immune system of a human body against this dreadful pandemic disease. Despite some prodrug antiviral compounds are in practice to recover the patients suffering from covid-19, however, co-morbidity deaths are highest among the total deaths happened so far. This concurrence of a number of diseases in a patient along with this viral infection is indicative of the poor immunity. Literature background supports the use of NO as immunity boosting agent and hence, the nitric oxide releasing compounds could act as lucrative in this context. Some dietary suggestions of NO-containing food items have also been introduced in this article. Also, the profound effect of NO in relieving symptomatic severity of covid-19 has been opined in this work.

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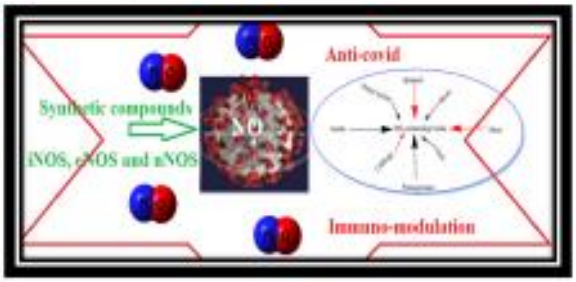
KEYWORDS
NO; Immunity; NO-release; food; synthetic moieties



Introduction

Nitric oxide (NO) is considered as a biologically important free radical that is produced during the metabolic pathway of L-arginine (Mir et al., 2019). The molecule has been proven of its physiological role in maintaining vascular tone, neuronal functionality, tumor-suppressing ability and more importantly profound implicative in human immune system as well as a microbicide (Maurya & Mir, 2014; Mir et al., 2017; Palmer et al., 1987). Moreover, NO generated naturally is expressive in so many immune functions, viz, T-cell regulation. Due to the fact that this molecule possesses its physiological impacts almost in every system of a human body, scientists are busy in developing NO-releasers for the beneficial applicability in case of the requirement wherein its production is too low to maintain homeostasis (Hibbs et al., 1987). In due course so many inorganic and organic NO-donors have been proposed by the scientific community. Some of them are even consumed by well defined commercial names generally called as NO-boosters (NO-supplements) (Mir et al., 2019).

As of now the world is suffering from the deadly viral pandemic generally known as corona virus-19 (COVID-19). Till now no treatment is available for this disease. However, some known viral drugs and social distancing have decreased the effect and spread of this calamity. Such declining infection rates and lockdown strategies have shown a ray of hope. But, these precautionary measures alone are not sufficient to lessen the increasing peak of the covid-19 affected statistical graph. Even the developed countries like USA are hopeless in this combat. The increasing trend of this catastrophe thus cannot be halted completely. For every field

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Fixed Point Theorems Concerning Hausdorff F-PGA Contraction in Complete Metric Space

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Abstract.

Harandi Amini-Harandi [2012], in 2012 established the existence of a fixed point by using the concept of set-valued contraction. In the present paper, authors have generalized this concept by considering Hausdorff F-PGA contraction and assured the existence of a fixed point. Hence, it is interesting to note that in a complete Hausdorff metric space, the fixed point exists with a lighter contraction map.

1. Introduction

Fixed point theory, has always been an important branch of Mathematics, the concepts of fixed point theory play a crucial role in solving various mathematical problems Zhao and Li [2011], Hussain et al. [2014]. Researchers consider various spaces Mishraa et al., Mishra et al. [2020, 2015b], and study existence and uniqueness of the fixed points in these space by applying different contraction mappings Sanatee et al. [2020], Mishra et al. [2020, 2015a]. Nadler Nadler et al. [1969] generalized the notable work of Banach Banach [1922] by proposing the concept of multi-valued contraction mappings. The concept of multi-valued contraction mappings was further studied by Wardowski Wardowski [2012] who introduced a new concept of contraction called the F-contraction and given a benchmark theorem, which generalized the Banach contraction principle. Harandi Amini-Harandi [2012] used this F-contraction map and established some important results concerning the generalization of the Banach contraction principle in context to the F-contraction. It may be noted that we have previously defined the F-PGA contraction map Powar et al. [2018], which was found to be a generalized form of the F-contraction map. In this paper, we have taken a complete metric space, with a Hausdorff metric defined on it. Further, we define the F-PGA contraction map over this complete metric space, called the Hausdorff F-PGA contraction map. Using this Hausdorff F-PGA contraction map, we have generalized the averments of Harandi Amini-Harandi [2012] and established the existence of a fixed point for Hausdorff F-PGA contraction.

2. Preliminaries

In this section, we list some of the basic definitions and examples which are being used in this paper and are required, to get an insight into the concept.

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Groundwater for Sustainable Development
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Research paper

Physico-chemical analysis of groundwater during monsoon and winter season of Dindori district, India

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Abstract

The physico-chemical parameters of the groundwater of 28 villages belonging to 7 community development blocks of Dindori district, India were assessed during monsoon (July-15th September 2017) and winter (December 2017–January 2018) season. Standard methods of A.P.H.A. were followed for analysis and interpretation of results. The mean values of pH, iron and sulphate exceeded the desirable limit prescribed by the Bureau of Indian Standard. Groundwater sample of village Chanda is not suitable for drinking an domestic purpose as it contains higher values of TDS, nitrate and sulphate as compared to permissible l of the B.I.S. ANOVA indicates a significant difference between the monsoon and winter period values of temperature and total dissolved solids at α=0.05. The rest of the parameters of both the periods did not differ significantly. The Duncan's multiple range test indicates that harmonic mean of temperature, sulphate, TDS and BOD of all the seven blocks were homogenous at α=0.05 and rest of the parameters showed 2 to 3 subsets of different blocks. The coefficient of correlation revealed strong positive correlation between calcium hardness and TDS, nitrate and TDS, iron and TDS, sulphate and TDS, BOD and iron. The high negative correlation was observed between sulphate and iron, sulphate and nitrate. Some of the parameters were moderately and some were poorly correlated with each other.

Graphical abstract

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Diversity and expression of *Plasmodium falciparum var* gene in severe and mild malaria cases from Central India

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Highlights

- "cys2/MFK*/*REY" motif with short length were restricted to cerebral and severe malaria.
- Higher expression level of var group A was associated with malaria severity.
- Peptide VAR P5 (DIGDIVRGKDLY) appeared to be a good marker for severity.

Abstract

Background

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Engineering of dielectric composites on electromagnetic and microwave absorbing properties for operation in the *X*-band

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In this study, carbon black (CB) powder-loaded polyurethane (PU) composites (CB–PU composites) were prepared by melt mixing method with different volume percentages (45, 50, 55, 58 and 61 vol.%) of CB in the PU matrix. The prepared CB–PU composites had been further studied for surface morphology using the field-emission scanning electron microscopy (FESEM) technique. Dielectric properties in terms of real permittivity (ε') and imaginary permittivity (ε'') of the fabricated composites were computed using an Agilent E8364B vector network analyzer in the frequency range of 8–12 GHz (*X*-band). Dielectric loss factor of the prepared CB–PU composites was computed in terms of the dielectric loss tangent ($\tan\delta_\varepsilon = \varepsilon''/\varepsilon'$). Microwave absorbing properties were appraised in terms of the reflection loss (RL) which in turn was calculated for varying thicknesses of the prepared composites from the measured real and imaginary permittivity data. The minimum RL was observed as −20.10 dB for the absorber with a thickness of 2.2 mm and the bandwidth achieved was 1.92 GHz for RL ≤ −10 dB. Based on the above results these CB–PU composites have potential use as effective microwave absorbers in 8–12-GHz (*X*-band) frequency range.

Keywords: Carbon black; dielectric materials; polymeric composites; complex permittivity; absorbing properties.

1. Introduction

Nowadays, various research works have developed microwave absorbers and investigated their electromagnetic (EM) and radar-absorbing properties to protect the sensitive avionics and electrical equipment which are operating in the gigahertz frequency ranges.[1] Development of high-performance microwave absorbing materials (MAMs) is a great challenge for researchers across the globe so far. Electromagnetic wave transmitted from the EM sources with certain GHz frequency is utilized for different purposes like in medical applications, wireless information transfer, imaging, broadcasting, etc. Currently, various types of filler materials, dielectric, magnetic and conducting materials, have been applied in the design and development of microwave absorbing composites (MACs).[2,3] The outcomes of conducting absorbing materials have motivated researchers to develop MACs that are thin, light in weight, flexible and have moderate functional properties. Many parameters are related to the performance of filler materials and their composites, such as the ionic radius and structure of fillers, conductivity of fillers, state of dispersion, methods and most importantly, the dispersion ratio of materials. A variety of frequency-response dielectric and other relaxation parameters have been studied.[4,5] Dielectric composites offer extra reliable electrical polarization and better functional properties than the macroscopic polymeric composites.[6,7]

In this research work, carbon black (CB) powder is used as a conductive filler material to fabricate the polymeric composites. Polymeric composites are fabricated by dispersion of conductive filler materials into the polymeric matrix. These polymeric composites were prepared by incorporating the conductive filler (CB) into the polyurethane (PU) matrix applied using wet mixing method. The starting filler materials are commonly in the form of fibers, powder, flakes or layered shape. The aim of this study is to fabricate a series of CB–PU polymeric composites that can be utilized as dielectric microwave absorbers, applicable in high-GHz-frequency region.

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Environmental Technology & Innovation
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Thermo stable tyrosinase purified from *Pleurotus djamor* grown in biomimetic calcium carbonate: A biological strategy to industrial waste remediation

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Abstract

A novel, neutral and heat-tolerant tyrosinase produced from *Pleurotus djamor (P. djamor)* using biomimetic calcium carbonate which was further used for the biodegradation of the phenolic waste of industrial effluents. Carbon-dioxide was sequestered/captured into calcium carbonate ($CaCO_3$) using carbonic anhydrase (2.1 U/mg protein) of *Oceanobacillus* with sequestration capacity as 24.7 $CaCO_3$/mg protein in 25 s. This $CaCO_3$ was used as a substrate for cultivation of *P. djamor* (a mushroom) which was the potential source of tyrosinase. Mushroom tyrosinase was purified up to 51.7 folds purity which shown a molecular weight ~ 90 kDa on SDS-PAGE. The optimal thermal and pH activity of the tyrosinase was observed at 50°C and 7.0, respectively. The tyrosinase was stable within a pH range of 6.0–8.0, temperature 35°C–55°C and showed high substrate specificity for L-DOPA. Tyrosinase activity was drastically enhanced by Cu^{2+}, Ca^{2+} and Mn^{2+} metal ions. K^{+} ions were also found to inhibit the tyrosinase activity up to the moderate level. Mushroom tyrosinase was used to degrade phenol from industry effluents with 90% removal in 6 h. Extracellular nature as well as tyrosinase stability in the extreme conditions (temperature, pH, and presence of heavy metals) makes it preferable candidate for phenol bioremediation from industrial effluents.

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From the journal:
New Journal of Chemistry

Nitric oxide as a therapeutic option for COVID-19 treatment: a concise perspective

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Abstract

In the prevailing coronavirus disease-2019 (COVID-19) times, scientists are eager to develop vaccines against COVID-19, and careful measures are being taken to develop an effective drug. Meanwhile, several antiviral compounds have been repurposed for COVID-19 treatment, and drug repurposing has yielded satisfactory results. In the meantime, nitric oxide (NO) is also under clinical trials to find its potentiality as anticoronavirus. This work aims to describe the therapeutic potential of NO for the treatment of deadly COVID-19. The significance of NO in mitigating COVID-19-associated symptomatic complications has also been addressed. NO being a molecule of significant biological interest is naturally synthesized in mammals and is the first member of the "gasotransmitters". Biosynthesis and biological target studies reveal that this molecule bears the potential to stabilize oxidation stress and

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Advanced Drug Delivery Systems in the Management of Cancer
2021, Pages 141-154

Chapter 12 - Advanced drug delivery systems in blood cancer

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Abstract

Blood cancer is caused by the accumulation of malignant transformations that are originated from the cells of primary or secondary lymphoid organs. The three major blood cancers are multiple myeloma, lymphoma, and leukemia. Blood cancer is possibly treated by chemotherapy, radiotherapy, immunotherapy, and transplantation of bone marrow. Various chemotherapeutic drugs are currently available for treating blood cancer, but still, the use of these clinical drugs is limited due to a lack of tumor cell specificity and dose-related toxicity. In addition, the poor pharmacokinetic profile of these chemotherapeutic agents requires the use of high doses and frequent administration of the drug to assert the threshold therapeutic levels at the site of tumor, thus leading to increased adverse effects in patients. There is an urgent need of developing a suitable and advanced drug delivery system with improved pharmacokinetic properties, safety, and efficacy of conventional therapeutics. The advanced drug delivery systems such as liposomes, nanoparticles, and dendrimer have enhanced pharmacokinetic properties for anticancer therapeutics. For earlier detection of cancer biomarkers in the blood circulation, new advanced drug delivery systems were designed with increased selectivity and sensitivity. They are proved to have enhanced efficacy of anticancer therapeutic drugs compared with conventional chemotherapy. The biocompatibility, biodegradable, and the small submicron-sized particles (20–200nm) help in overcoming multiple drug resistance. The enhanced permeability and retention (EPR) effect of these small-sized particles allow them to get accumulated at the tumor sites resulting in rapid angiogenesis and inflammation. This chapter gives a description of different therapies as well as the advantages and limitations of advanced drug delivery formulations employed for treating various blood cancers. Additionally, recent investigations, formulations of nanomedicine, and their applications in the treatment of blood cancer are discussed in this chapter.

Previous Next

Keywords

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Generalized e-closed sets and generalized e-continuity in intuitionistic fuzzy topology

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Abstract

The purpose of this paper is to introduce and study the concepts of intuitionistic fuzzy generalized e-closed sets and intuitionistic fuzzy generalized e-open sets in intuitionistic Fuzzy topological space. We investigate some of their properties. Further the notion of intuitionistic fuzzy ${}_eT_{1/2}$ spaces, intuitionistic fuzzy GEO-connectedness, intuitionistic fuzzy GEO-compactness are introduced and studied.

Keywords: Intuitionistic fuzzy sets, intuitionistic fuzzy topology, intuitionistic fuzzy ge-closed sets and intuitionistic fuzzy ge-continuity.

2020 MSC: 54A40, 03F55.

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Article

Doi 10.5943/sif/6/1/6

Aquatic fungal diversity in two freshwater ecosystems of Madhya Pradesh, India

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Mehboob A, Ganie AH, Dar AR, Soni KK 2021 – Aquatic fungal diversity in two freshwater ecosystems of Madhya Pradesh, India. Studies in Fungi 6(1), 116–137, Doi 10.5943/sif/6/1/6

Abstract

Aquatic fungi play an important role in litter decomposition in aquatic ecosystems. Keeping in view the importance of aquatic fungi, diversity of these organisms was studied in two freshwater ecosystems of Gaur River and Khurji Nala Jabalpur Madhya Pradesh India. During the present study, 34 fungal species and 6 chromista species have been recorded on decomposing substrates. Highest number of fungal genera were recorded in submerged litter samples of *Tectona grandis* followed by *Dendroclamus strictus.* The maximum percentage frequencies of various fungal species which colonize litter of different tree species were also recorded. The cluster analysis revealed that different fungal communities on various plant hosts vary significantly.

Key words – Colonization – decomposing substrate – fruits – litter – mixed twigs

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A Ru (II) complex of 2-(diphenylphosphino)-benzylidene and ethanethiol, cis-[RuCl2 (P-N) (PPh3) (EtSH)]: A computational approach

Pushpendra S Jaget, Pradeep K Vishwakarma, Mahendra K Parte and Ram C Maurya

Abstract
This manuscript reports the computational studies of a previously synthesised compound, *cis*-[Ru Cl_2 (P-N) (PPh_3) (EtSH)] 1. The optimised molecular structure, orbital and atomic charge analysis, NLO assets and electrostatic potential properties were studied through DFT approaches via mixed basis set at B3LYP/LANL2DZ level of theory. Therefore, the computed ^1H and ^{13}C-NMR chemical shifts were obtained with the GIAO method. Moreover, the TD-DFT based electronic absorption spectrum was computed using the PCM model. The theoretical studies were used to explain the molecular structures of the studied compound. Finally, insilco ADME properties were studies show good physiochemical and bioactivity of the studied compound.

Keywords: Ru (II) complex, FMOs, NLO, TD-DFT and ADME

Introduction
The discovery of NO, CO, and H_2S as small signalling gasotransmitters has developed a new type of science that endogenously derived gases could elicit crucial biological functions and contribute to the pathogenesis of human diseases (Hermann. 2012) [15]. In mammals, H_2S is endogenously produced by enzymatic reactions, even if some non-enzymatic pathways are involved in the biochemistry of hydrogen sulphide. It is present in micro molar concentrations in blood (Zhao *et al.*, 2001) [38]. Manifold chemical and biochemical catabolic fates await newly synthesised H_2S, and many more are probably still to be discovered (Li *et al.*, 2011) [21]. Despite these biochemical means for H_2S catabolism, it is a powerful reducing agent and is likely to be consumed by endogenous oxidant species in the vasculature (Whiteman *et al.*, 2004; Chang *et al.*, 2008; Geng *al*, 2004) [37, 6, 13], *viz.*, peroxynitrite, superoxide and hydrogen peroxide. According to another report (Bayse *et al.*, 2013) [2] H_2S being a weak acid (pK_{a1}:6.76, pK_{a2}: 19.6) exists primarily as SH^- (82%) rather than H_2S (18%) or S_2^- (< 0.1%) under physiological conditions. It should be emphasised that H_2S and SH^- may both contribute directly to the biological action of hydrogen sulphide, and that SH^-, the predominant sulphide species under physiological conditions, is a more potent nucleophilic than Cys or reduced glutathione (GSH), which readily binds to metal centres in biological molecules (e.g., haemoglobin) or reacts with other compounds. The second pKa value (pKa_2) of H_2S is now settled (Hughes *et al.*, 2009) [17] to be 19±2. Therefore, the sulphide anion S^{2-} is present at low concentrations at pH 7.4, with a mole fraction of 1.7×10^{-12} and is unlikely to participate in the biological chemistry of H_2S. Hydrogen sulphide is rapidly oxidised, mainly in mitochondria, initially to thiosulfate and subsequently to sulphite and sulphate. This oxidation is not enzymatically driven, while thiosulfate conversion to sulphate or sulphite is catalysed by thiosulfate cyanide sulfotransferase (TST). Also, sulphite originating through this reaction is quickly oxidised to sulphate, as sulphate is the major end-product of H_2S metabolism under physiological conditions. However, urinary thiosulfate is considered a nonspecific marker of whole-body H_2S production (Belardinelli *et al.*, 2001) [5]. H_2S is soluble in many solvents, including water, acetone, carbon disulphide, methanol, ethanol, ether, chloroform, and benzene. Some data on the solubility of H_2S in a range of non-aqueous solvents are available (Fischer *et al.*, 2002; Guenther *et al.*, 2001) [10, 14]. At concentrations of <100 ppm, the toxic effects of H_2S in humans include eye irritation, sore throat, dizziness, nausea, shortness of breath, and chest tightness (Beauchamp *et al.*, 1984; Reiffenstein *et al.*, 1992) [3, 33].

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Synthesis, spectral, FMOs and NLO properties based on DFT calculations of dioxidomolybdenum(VI) complex

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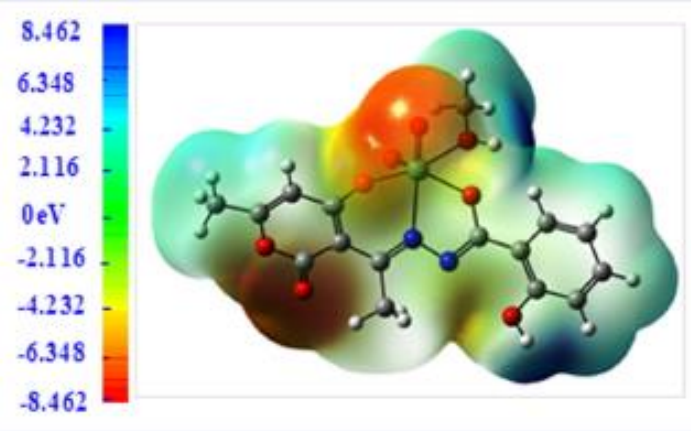
ABSTRACT

Mononuclear dioxidomolybdenum(VI) complex with *N*-(dehydroacetic acid)-salicylic acid hydrazide having the formula $[Mo^{VI}O_2(dha\text{-}sah)(CH_3OH)]$ is reported. The complex was synthesized by reaction of $[Mo^{VI}O_2(acac)_2]$ with the said ligand in 1:1 metal-ligand ratio in methanol. The complex was characterized by elemental analysis, ^1H and ^{13}C NMR, FT-IR, electronic absorption spectroscopic and powdered X-ray diffractometry studies. Assignments of molecular geometrical parameters, molecular electrostatic potentials, nonlinear optical properties and frontier molecular orbitals of the titled complex were performed with the Gaussian 09 software package using density functional theory methods with B3LYP hybrid exchange-correlation functional and the standard LANL2DZ basis set. The experimental spectral analysis has been found in good agreement with the theoretical results. The overall study has revealed that the complex under investigation possesses a distorted octahedral geometry.



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Theoretical Study of Photo-Luminescence Emission Using the Line Shape Function for Semiconductor Quantum Dots

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The outcome of particle size effect on Photoluminescence has been investigated theoretically for CdS, ZnS, CdSe and ZnSe quantum dots. The theory is based on computational modeling in the strong confinement region only where the particle size is less than Bohr's radius. The Photoluminescence emission line shape function which depends on band gap was found to be strongly dependent on particle size. The PL spectra of bulk material is similar for the quantum dots where similar vibronic coupling and normalized intensity is considered, only the peak wavelength changes and thus shifts the band edge luminescence peak to higher energies for the quantum dots corresponding to their band gap with no broadening. The PL spectra of monodisperse dots revels the fact that the shape of the emission peak is same, only it shift towards higher energy or smaller wavelength for decreasing size of quantum dots.

Keywords: Effective mass approximation, Quantization, Line shape function, Exciton bohr radius.

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1. INTRODUCTION

Quantum dots are semiconductor nanocrystals in the range of 1-10 nm with sizes smaller than the Bohr exciton radius due to which quantum size effect in semiconductor QDs occur. It forms a zero dimensional semiconducting nanocrystal so called as dot [1]. Its optical and electronic behavior in this size regime lies between molecular and bulk form of matter. They

for CdS, ZnS, CdSe and ZnSe is described theoretically here using the concepts of condense matter physics, quantum mechanics and MATLAB programming.

2. THEORETICAL MODELING

2.1 Variation of Band Gap with Particle Size

Brus et al [8] considered the bulk materials, where the electron-hole pair is free to move in small quantum

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On β-local Functions in ideal topological spaces

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Abstract. In this paper, by using β-open sets in [1] we introduce and investigate the concepts of the β-local function, I_{s^*g}-β-closed sets and I_g-β-closed sets in an ideal topological space. In addition to the properties, an operation cl^*_β is defined and the properties are obtained similarly with the local function in [8].

2020 Mathematics Subject Classifications: 54C10, 54A05, 54D15, 54D30

Key Words and Phrases: β-open set, β-local function, operation cl^*_β, I_{s^*g}-β-closed set, I_g-β-closed set.

1. Introduction

Kuratowski [11] has introduced the concept of an ideal topological space in 1930. Further, Jankovic and Hamlet [8] have studied ideal topological spaces and obtained their significant properties. They introduced the concept of I-open sets and studied topologies via ideals quite extensively. Abd-El-Monsef et al.[2] further explored the ideas of I-open sets. The concept of I_g-closed sets has been given by Dontchev et al. [6] in 1999 and the idea of I_{s^*g}-closed sets was first introduced by Khan and Hamza [9]. The concepts of the s-local function was first introduced by Abd. El-Monsef et al. [3] and further investigated by Khan and Noiri [10].

Recently, Al-Omari and Noiri [5] have introduced and investigated the notion of local function Γ^* in an ideal topological space and showed that Γ^* is equivalent to the δ-local function due to Hatir et al. [7]. In this paper, by using β-open sets in [1] we introduce and investigate the concepts of the β-local function, I_{s^*g}-β-closed sets and I_g-β-closed sets in an ideal topological space. And also, an operation cl^*_β is defined and the properties are obtained similarly with the local function in [8].

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Analytical Methods

A micellar mediated novel method for the determination of selenium in environmental samples using a chromogenic reagent

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CREATIVITY AND INNOVATION POSSIBLE WITH HEALTHY AND MEDITATIONAL AWAKED MIND

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ABSTRACT

The brain broadly differentiated into three parts like Conscious mind, Subconscious mind and Unconscious mind, which are responsible for control all the activity of our body. Our brain works 24 hours without taking any rest, so it is very important to awake and sharp our mind and make active our brain through many activities like chanting, yoga and meditation. These activities arose in the age of Vedas and Upanishad. These are India's oldest scientific complete spiritual discipline. Through all these activities we can trained our mind and developed its power of subtle perception by doing yoga we can realise our hidden strength through meditation we can explore our spiritual life. In meditation it is the simplest way to increase eternal power and it does not need any special requirement during meditation only sit calm and don't doing anything physically and mentally and focus your mind on a particular thing which full of consciousness and this process is called Meditation. The simplest way of spiritual meditation is the chanting of word Aum. Chanting of Aum can helps in removal of body's Stress and Incorporate New Positive Energy in your body. While Modern Science tends to look outward through experimental model, the ethetics of Yoga Meditation and Chanting enables us to stretch the depth of our own self. Stress is an unavoidable and constant feature throughout the lifetime, induces autonomic dysfunction for which meditation is examined to be antidote. With the help of these magical remedies our physical and mantle health may becomes strong and result in long healthy and happy living.

KEYWORDS: Esthetics, Conscious, Subconscious, Unconscious, Yoga, Meditation.

1. PARTS OF MIND

a. ***Conscious Mind:*** - In our daily life while we are in awaken state conscious mind is responsible for our thinking and acting. For example- Driving, talking, and studying whatever we do when we are active. It is powerful but it is dependent on the subconscious mind in large amount (Prasad *et al* 2014)

b. ***Subconscious Mind***: - One of the most powerful information processor known is our subconscious mind. It observes all the internal awareness of our body, the conscious mind focuses on a finite scope of activities and information but the subconscious mind is virtually infinite in the amount of information it can process. In fact in our daily life most of what we see, hear is controlled and kept by the subconscious mind. Scientist evaluate that about 95% of what we do is regulated by our subconscious mind (Kartheek, 2014)

Natural Products: From Chemistry to Pharmacology (C Ho, Section Editor)
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Contrive Himalayan Soft Gold *Cordyceps* Species: a Lineage of Eumycota Bestowing Tremendous Pharmacological and Therapeutic Potential

Loknath Deshmukh, Anil K. Sharma & Sardul Singh Sandhu

Current Pharmacology Reports **6**, 155–166 (2020)

Abstract

Purpose of Review

In the present review, two strain improvement strategies viz. transformation system development and inter-specific protoplast fusion for this mushroom are hypothesized.

Recent Findings

The entomopathogenic medicinal mushroom *Cordyceps* species has been bestowing health biologically and pharmacologically for years. It harbors a variety of bio-metabolites having far-ranging activities. One of the constituents, cordycepin alone, is involved in a plethora of biochemical and molecular processes. With this

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Antibacterial and fibrinolytic potential of Himalayan soft gold mushroom *Cordyceps sinensis*

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The medicinal mushroom *Cordyceps sinensis* collected from Himalayan region of India was found to have bioactive compounds. The mycelia free culture filtrate obtained from fermentation of *Cordyceps* mycelia were partially purified by solvent-solvent extractions. The subsequent fractions were tested for their potential regarding antibacterial and fibrinolytic activity. The butanolic fraction and aqueous layer showed significant antibacterial activity against six bacterial strains.While the final aqueous layer and hexane fraction showed partial fibrin lytic capacity in comparison with commercially available streptokinase as a positive control. It was assumed that the metabolite fractions when purified further can act as good antibacterial and fibrinolytic agents.

Keywords: *Cordyceps sinensis*, bioactive compounds, solvent fractions, antibacterial activity, fibrinolytic activity

Introduction

Fungi are found to be one of the best sources of alternative medicines apart from plants and bacteria. They have the potential to produce novel compounds which are medicinally very important[1]. Higher fungi especially medicinal mushrooms are being studied since ages for their bio-metabolites and are renowned for the treatment of various diseases[2]. One of the most important and demanding medicinal mushroom belongs to class ascomycetes is *Cordyceps* a soft gold, having a valuable source of natural products with diverse biological activities. This is entomopathogenic in nature and exists asgrowth from the body of infected insect[3]. Fungus *C. sinensis* is endemic to the grasslands and shrubs of Central Asia and grows in a frigid and arid environment at the elevations of 3500–4500 m[4,5].

This medicinal mushroom is considered as therapeutic bio-factory, which possesses anti-cancer, anti-metastatic, anti-microbial, anti-inflammatory, anti-oxidant and immuno-stimulating properties[6-7]. The cultivation and collection of *Cordyceps* from its habitat is challenging; because it is rare and scarce. However, the ever increasing demand of this medicinal mushroom and its metabolites leaves us with little choice but to cultivate it artificially[8-9]. Today *C. sinensis* becomes very prominent mushroom and cultivated from anamorphic mycelia for its medicinal and pharmaceutical properties[10].

The resistance in pathogenic organisms against various available drugs leads to necessitate the new drugs from new sources[11]. The disorders in fibrin network and blood clotting result in thrombosis, which induces deadly diseases like myocardial, cerebral and pulmonary infarction. Hence, the present study is based on the artificial cultivation of anamorphic mycelia of *C. sinensis* collected from Indian Himalayas. The metabolites obtained were then subjected to test for their antibacterial and fibrinolytic potential.

Materials and Methods

Collection and Isolation of Culture

The *Cordyceps sinensis* fruting body was collected from Pithoragarh District of eastern Uttaranchal, India in the month of June-July 2014. The specimen was stored in a sterilized plastic bag and brought to the laboratory (Fungal Biotechnology and Invertebrate Pathology Laboratory) where it was grown on selected and optimized PPDA (potato dextrose agar with peptone) media plates at 20 ± 2°C for 10 days. Initially, small pieces were cut and taken out from the specimen and were surface sterilized by sodium hypochlorite and 70% ethanol in order to grow

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Extracellular antibacterial substances in *Anabaena fertilissima* CCC597 kill bacteria by triggering oxidative radicals and destroying membrane integrity

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With 7 figures and 3 tables

Abstract: An axenic culture of a cyanobacterium in the spent medium produced hexane-extractable compound(s) that antagonized growth of several Gram+ve and –ve bacteria, including a few potential pathogens. Phylogenetic investigations classified the strain to be *Anabaena fertilissima* strain CCC597. Using *Escherichia coli* MTCC443 as a test organism, we have shown that ROS (O_2; H_2O_2) production and outer and inner membrane (OM: IM) permeabilization were induced upon such treatments. Consequently, leakage of proteins and cytosolic acidification processes were initiated. Suppression of cytoplasmic membrane-bound respiratory O_2 consumption was most likely the physiological aberration that killed the bacteria. Several antioxidant enzymes *viz*. superoxide dismutase, catalase, and peroxidases showed concomitant increase in the enzymatic activities and band intensities in the corresponding substrate gels. Notwithstanding, the counteraction mechanism(s) was not preventive, and sufficient oxidative radicals still generated to manifest lipid peroxidation. Chemical analysis of the hexane-extract of *A. fertilissima* culture filtrates revealed presence of a number of long chain unsaturated fatty acids, including cis-13,16-docosadienoic acid,

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Photosynthetic microorganisms (Algae) mediated bioelectricity generation in microbial fuel cell: Concise review

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Original Article

Analytic solutions of the generalized water wave dynamical equations based on time-space symmetric differential operator

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Highlights

- We defined a new fractional calculus (called conformable calculus) to satisfy the symmetry of solutions of water wave equation (WWE).
- We considered 3D time-space WWE. All variables are given under conformable differential operators (real and complex).
- We formulated analytic solutions of WWE based on the rotated Koebe function.

Abstract

It is well known that there is a deep connection between the symmetric and traveling wave solutions. It has been shown that all symmetric waves are traveling waves. In this paper, we establish new analytic solution collections of nonlinear conformable time-fractional water wave dynamical equation in a complex domain.

ScienceDirect

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Fracto- mechanoluminescence of sugar crystals measured with different techniques

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Abstract

Here in, we report the mechanoluminescence (ML)from sugar crystals measured with different techniques. In case of statical loading technique, many ML pulses originate from sugar crystals and the total number of ML pulses increases linearly with increasing applied load. However, in case of impulsive excitation technique, the ML intensity increases linearly with increasing time, attains a saturation value and finally decreases with time. Semilog plot of ML intensity vs $(t-t_m)$curve gives negative slope. The value of t_m decreases with increasing impact velocity while it increases with the thickness of the sugar crystals. A linear relation between peak ML intensity and impact velocity has been observed in the present case where the total ML intensity initially increases linearly with impact velocity and gets saturated. The temperature has a negative effect on ML intensity. The ML intensity is found to decrease with increasing temperature. At the higher velocities, the decay is fast and it slows down at lower velocities. The pulse induced ML is a new and advanced technique in which when the sugar crystals are deformed, the ML pattern is similar to that as obtained during impulsive excitation with minor differences. At low impact pressures, fast and slow decays are found, while at high impact pressure only fast decay is witnessed. The ML intensity increases and is proportional to impact pressure for sugar crystals whereas the total ML intensity is found to be dependent of the volume of the sugar crystals.

Evaluation of DC and AC Conducting Properties of Poly (diaminonaphathalene) Conjugated Polymer Doped in Poly (vinyl alcohol) Films

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Abstract. Poly (diaminonaphthalene) doped poly (vinyl alcohol) was synthesized by in-situ chemical oxidation polymerization method. The complex conduction mechanism of obtained PDAN doped PVA films were examined by measuring DC and AC conductivity. Non-linear I-V characteristics curve confirming the semiconducting nature of the films at constant temperatures. The DC and AC conductivities of the 0.791g PDAN doped PVA films were $(2.041\pm0.64)\times10^{-5}$ Scm^{-1} and $(6.28\pm0.79)\times10^{-6}$ Scm^{-1}, respectively. The DC conductivity so obtained was six folds larger than earlier reported.

INTRODUCTION

In order to understand and analyze the mechanism of conduction in the polymeric nanocomposites one has to seek insights into the fact that how the electrical conductivity varies with temperature and frequency. There are four conditions that are responsible for the conductivity of the polymer materials, viz, the existence of charge carriers, overlapping of molecular orbitals to result in carrier mobility, mobility of π -bonds and charge hopping between polymer chains [1].

Direct Current (DC) conductivity measurements provides valuable knowledge about the impurities, nature of current carriers and scattering effect of the conducting polymers. The measurement of alternating current (AC) is a significant experimental tool that helps in exploring microscopic images of disordered systems. These techniques are of immense technological and fundamental applications. The complete studies of conducting mechanism related to applied voltage, temperature and applied frequency for polymeric materials provide to understand the electrical phenomena for their use as electrical appliances. The mechanism of charge transport for the charge carriers at low frequencies or direct current depends on intra-chain connection of the conducting polymers whereas at high frequencies the charge carriers become localized in small regions of low-energy barriers [2]. At the same time by doping materials inside the conducting polymers, the mechanical properties are also enhanced which are also useful for the applications like sensors and actuators i.e. plastic microelectronics [3-5].

Distribution of intermolecular and intramolecular hopping rates inside the conjugated polymers makes the conductivity complex i.e. AC conductivity. The measurement of DC conductivity provides information about the distribution of individual hoping rates only and does not suggest for any concrete information about the conduction mechanism in conducting polymers. On the contrary, the AC conductivity measurements provides useful information about how the conducting polymers exhibit conductivity [6].

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Arginine deaminase from *Pseudomonas aeruginosa* PS2: purification, biochemical characterization and in-vitro evaluation of anticancer activity

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Abstract

In the present study, arginine deaminase (ADI) was purified from *Pseudomonas aeruginosa* PS2 which showed relative molecular mass of 70 ± 3 kDa on native-PAGE and 36 ± 0.5 kDa on SDS-PAGE. Purified ADI exhibited optimum activity at pH 6.5 and temperature 40 °C. Metal ions, K^{+} and Mg^{2+} had positive, while Mn^{2+}, Cr^{2+}, Co^{2+}, Fe^{3+}, Ni^{2+}, Cu^{2+}, Cd^{2+} and Hg^{2+} had negative effects on catalytic activity of ADI. Purified enzyme showed high substrate specificity towards natural substrate L-arginine and did not hydrolyse its structural analogues. *In-vitro* serum half-life of purified ADI was 40 h, whereas proteolytic half-life was 28, 27, and 32 min against trypsin, elastase-I and proteinase-K.

An efficient key authentication procedure for IND-CCA2 secure Paillier-based cryptosystem

Chandrashekhar Meshram[6,7] · Mohammad S. Obaidat[2,3,8] · Cheng-Chi Lee[4,5] · Sarita Gajbhiye Meshram[1]

Published online: 24 February 2020

Abstract
Public key cryptosystems more recently developed have to be strong against newer and more advanced forms of attacks. The security protection of a public key cryptosystem relies heavily on the design of the public key. The key authentication procedure is one of the easiest and most advantageous authentication mechanisms used over insecure networks and widely applied for the remote login with various operation systems, computer networks, wireless networks, database management systems, and many others. In a typical key authentication procedure, however, there is at least one authority involved to authenticate the keys. In this paper, we shall propose a new key authentication procedure built on the basis of the decisional composite residuosity assumption. As with ordinary certificate-based procedures, the proposed procedure involves no authorities. With the certificate of the public key of a client being a blend of his/her private key and password, the proposed procedure is exceptionally secure, and the authentication process is very simple.

Keywords Public key cryptosystem · Authentication procedure · Decisional composite residuosity assumption · Certificate-based procedure

1 Introduction

Public key cryptography (PKC) is widely applied in fields like information security and secret communication. In the world of public key cryptosystems, every client has a pair of keys, namely a public key and a private key. The public keys, generally set away in a public document known as a public key directory (PKD), are imperative yet vulnerable. An attacker can undoubtedly pretend to be a legal client and try to replace this client's public key with a fake one. Therefore, the key authentication procedure (KAP) plays a dominant role in providing the system's security protection. In a typical public key cryptosystem, the key authentication procedure includes the involvement of at least one authority, which in different systems can have different names, such as trusted center (TC) or key

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Evaluation of antihypercholesterolemic activity of green alga *Haematococcus pluvialis* astaxanthin extract

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ABSTRACT

Introduction and Aim: *Haematococcus pluvialis* is one of the richest sources of natural astaxanthin, which is considered as a "super anti-oxidant". In the present study, we investigated the antihypercholesterolemic activity in the astaxanthin extract of green alga *H. pluvialis*.

Materials and Methods: To accomplish this, astaxanthin extracted with acetone and was separated by thin-layer chromatography. Animals were housed in separate cages under the controlled condition with temperature (22 ± 2°C) provided a 12 h light/dark cycle. Rats were divided into five groups; each group consisted of six rats. Group 1 (Normal group NC) rats were given (orally) normal standard rat feed (250 mg/kg b.w./per day). Group 2 was given high fat diet (250 mg/kg b.w./per day). Group 3 was given *H. pluvialis* astaxanthin extract (250 mg/kg b.w./per day). Group 4 was given astaxanthin extract along with a high protein diet (250 mg/kg b.w./per day) and group 5 was given astaxanthin standard, dissolved in an equal volume of liquid paraffin for 30 days.

Results: Among the treatment, astaxanthin extract was found to be an effective antihypercholesterolemic agent.

Conclusion: The present study reveals that *H. pluvialis* astaxanthin extract can be used for the different food formulations for human welfare.

Keywords: *Haematococcus pluvialis*; astaxanthin; antihypercholesterolemic; green alga.

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An Efficient Mobile-Healthcare Emergency Framework

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RESEARCH ARTICLE | NOVEMBER 02 2020

Absorption and crystalline studies on reduced graphene oxide:poly(vinyl alcohol) polymer nano composites films

Arti Sharma; Arunendra Kumar Patel; Anil Kumar Bajpai; Rakesh Bajpai

+ Author & Article Information
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Present study deals with the synthesis of reduced Graphene Oxide (rGO) and their nanocomposite films using PVA Polymer. The developed samples have been studied for their absorption and crystalline properties with the help of Uv-Vis Spectroscopy and X-Ray Diffraction techniques. The crystalline study reveals that, as we increase the concentration of rGO into the PVA matrix, the crystalline properties are also enhancing towards stable structure. The absorption study reveals that, as we are increasing the concentration of rGO into the PVA matrix the optical band gap decreases. On the basis of both studies, we can say developed polymer nanocomposite films are more stable beyond 4ml concentration of rGO solution.

Topics
Band gap, **Graphene**, **Crystalline properties**, **Polymers**, **UV-visible spectroscopy**, **Nanocomposites**, **Diffraction**

Poly (Vinyl Alcohol) Supported Flexible films of Graphene Oxide and Reduced Graphene Oxide and Their Structural Study

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Abstract. Graphite oxide or graphene has emerged as a promising material for researchers and technological world, because of its amazing mechanical property along with its super electrical property. Therefore, this material has being used in numerous potential utility viz, polymer channels, sensors, energy transformation, and vitality stockpiling gadgets. The synthesis and analysis of PVA Poly(vinyl alcohol) supported GO (graphene-oxide) thin films were described in the performed work. Graphene-oxide was obtained via a facile method which based on the modified Hummers reaction scheme. The morphology and physical properties of graphene oxide were analyzed via Fourier transforms infrared (FTIR), images of SEM and Raman spectroscopy. The spectral outcomes of FTIR analysis showed that the graphite flakes were oxidized, the outcome of this process various functional groups generated which are attached on diametrical ends of structure and basal plane such as C-O-C, C-O, COOH, and C-H, respectively on the surfaces of the graphene-oxide. From the study of Raman spectroscopy, the intensity ratio of G band and 2D band reveals that the obtained materials are monolayer. With the help of SEM analysis morphology of the material could be analyses.

Keywords: PVA; Graphene-oxide; reduced-graphene oxide; polymer nanocomposites; FTIR; Raman

INTRODUCTION

Graphite, which is one of the allotropes of carbon, has great potential to be transformed into graphene- oxide. Graphene-oxide, which is a novel transformation of graphite, is a 2D (two dimensional) precious substance. It offers remarkable mechanical [1,2]and thermal [3] properties. Moreover it shows excellent electrical properties [4] so that these properties establish the prevalence of graphene over traditional materials [5]. Graphene-oxide thin films can easily be prepared by solvent-casting methods [6] which find numerous applications in electronics, biosensors, charge storage applications, and fabrication of functional nano-composites [7]. When graphene oxide is formed from graphite, several oxygen containing functional groups are added to graphite, which means that graphene oxide carries many oxygen functional groups in its basal planes and along its diametrical ends. These sheets can easily be used for chemical functionalization and homogeneous dispersion in polymer matrices, and its subsequent de-oxygenationyields new composites materials [8].

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Structural –Morphological relative study of Polyphenylene Oxide and Polystyrene (PS: PPO) polymer blends

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Abstract. The objective of this research paper is to compare the structural and morphological characteristic of polymer blends of Poly (Phenylene Oxide) (PPO) and Poly (Styrene) (PS). A polymer blend is a mixture of two or more polymers that have been blended together to generate a new material with different physical properties. PPO and PS have a chance to give complementary properties to each other and hence there is a huge interest in studying the PPO: PS polymer blends. With these objectives, the present work focuses on the synthesis and characterization of polymer blends of polyphenylene oxide (PPO) and Polystyrene (PS). The Polymer blends of Poly (Phenylene Oxide) (PPO) and Poly (Styrene) (PS) has been prepared using solution casting technique. The pure polymeric samples and their blends PS:PPO in the ratio 95:05; 90:10; 85:15; and 80:20 of their weight percentage has been prepared. The prepared polymer blends were characterized by using X-ray diffraction (**XRD**) techniques for their structural characteristics, Fourier Transform Infrared Spectroscopy (**FTIR**), and Scanning Electron Microscopy (**SEM**) were undertaken for their surface morphological studies. It is found that, the interplanar distance, crystallite size and the order of crystallinity is maximum for 10 wt. % of PPO. The morphology of blends shows that PPO and PS are miscible with each other.

INTRODUCTION

Polymers can go through impressive structural and morphological changes in the confinement area, due to their very unstable nature. This may be produced by relatively weak variation of external condition, such as application of external fields, changes in temperature, moisture, mechanical stress etc. consequently surface rearrangement of the polymer chains as a result of environmental or interfacial interactions are often irregular. The search of innovative polymer materials motivates workers to polymerized new monomer, or from accessible monomer new random block or graft copolymer can be developed. A third substitute has been to blend existing polymers to fabricate material with new properties. This usually requires little or no capital expenditure relative to production of new polymer, which is a noticeable advantage of this approach. One of the key factors determining the performance of such new materials is miscibility between the polymers. This holds for ultra-thin film materials as well. Very few polymers are identified to be well-matched with each other in nature. Poly (2,6-dimethyl-l,4-phenylenoxide) (PPO) and Polystyrene (PS) form a pair of such polymers found to be compatible in melts[1,2]. Poly (2,6-dimethyl-l, 4-phenylene oxide) (PPO) is an attractive material for film preparation. It possesses outstanding mechanical properties and is resistant to a number of reagents. PPO is known as a good engineering polymer with superior mechanical properties and good miscibility with PS [1,2]. As polymer blends become more popular in research and in application, it is very important to know their structural and mechanical properties.

EXPERIMENTAL

The films of PS blended with PPO in various compositions of (100/0) (95/5), (90/10), (85/15), (80/20), (0/100) by weight percent were prepared using the solution– cast technique on an optically plane glass substrates inside an oven at 50°C using acetone and benzene (LR grade) as the common solvent. The sample so prepared was dried in air for 24

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Microhardness study of binary blend of Polyvinyl Formal and Polyvinyledene Fluoride

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Abstract. The preparation of polymer blends of Polyvinyl Formal and Polyvinyledene Fluoride in different weight percentages is described. The strength of these blends has been studied by measuring their surface microhardness making use of a Vickers microhardness tester.

INTRODUCTION

It has been recognized that the useful physical properties of polymers depend not only on the chemical structure but also on their supermolecular organization [1-2]. Polymers are characterized by a large number of intermediate stages of ordered arrangement of chains i. e. the existence of various levels of supermolecular organization which intervene between the crystalline and completely amorphous phases. Studies on polymeric blends, is therefore, important from the point of view of understanding morphology- property relationship or properties in relation to the crystalline and amorphous content of the polymer. The morphology of a polymer blend can be tailored and it is, therefore, possible to achieve a host of properties which cannot possibly be obtained by homopolymers alone.

Many polymeric blends have been found and reported over the last few decades [3]. A polymeric blend of Polyvinyl Formal (PVFO) and Polyvinyledene Fluoride (PVDF) is one such important blend. Polyvinyl Formal is a class of weakly polar polymer with excellent thermal, mechanical, chemical and hydrolytic stability, though it is hydrophobic. The polymer has been a material of interest for researchers for many years [4].

PVDF on the other hand is a semicrystalline polymer which has drawn both scientific and technological attention because of its useful dielectric properties and remarkable piezo-and pyro-electric properties. It is also one of the rarest polymers that exhibits diverse crystalline forms having at least five phases namely α, β, γ, δ and ε [5].

Microhardness testing has been utilized to obtain information on structural features and mechanical property changes for polymer blends. Further, the important aspect of the microhardness testing of polymers at low loads is that whether the hardness number is dependent or independent of the load [6-7]. It is with this view the effect of load on the microhardness of PVFO and PVDF polyblends have been studied.

EXPERIMENTAL

The commercial PVFO (*Powder*) and PVDF (*Powder*) used for the present study were procured from Solvay Corp. Ltd, Belgium and supplied by Redox Ltd. (India). The samples in the present investigation were prepared by the solution cast technique [8]. The solution of particular concentration was prepared by dissolving the two polymers PVFO and PVDF in different weight ratios in their common solvent N, N, Dimethyl formamide (DMF) at 80^0C. This solution was then poured on clean optically plain glass plates kept on a mercury pool in a dust free oven at a constant temperature, $T = 80^0$C, for 5 hr to yield blend films which was then peeled off from the glass plates [9]

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Evaluation of DC and AC Conducting Properties of Poly (diaminonaphathalene) Conjugated Polymer Doped in Poly (vinyl alcohol) Films

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Abstract. Poly (diaminonaphthalene) doped poly (vinyl alcohol) was synthesized by in-situ chemical oxidation polymerization method. The complex conduction mechanism of obtained PDAN doped PVA films were examined by measuring DC and AC conductivity. Non-linear I-V characteristics curve confirming the semiconducting nature of the films at constant temperatures. The DC and AC conductivities of the 0.791g PDAN doped PVA films were $(2.041\pm0.64)\times10^{-5}$ Scm^{-1} and $(6.28\pm0.79)\times10^{-6}$ Scm^{-1}, respectively. The DC conductivity so obtained was six folds larger than earlier reported.

INTRODUCTION

In order to understand and analyze the mechanism of conduction in the polymeric nanocomposites one has to seek insights into the fact that how the electrical conductivity varies with temperature and frequency. There are four conditions that are responsible for the conductivity of the polymer materials, viz, the existence of charge carriers, overlapping of molecular orbitals to result in carrier mobility, mobility of π -bonds and charge hopping between polymer chains [1].

Direct Current (DC) conductivity measurements provides valuable knowledge about the impurities, nature of current carriers and scattering effect of the conducting polymers. The measurement of alternating current (AC) is a significant experimental tool that helps in exploring microscopic images of disordered systems. These techniques are of immense technological and fundamental applications. The complete studies of conducting mechanism related to applied voltage, temperature and applied frequency for polymeric materials provide to understand the electrical phenomena for their use as electrical appliances. The mechanism of charge transport for the charge carriers at low frequencies or direct current depends on intra-chain connection of the conducting polymers whereas at high frequencies the charge carriers become localized in small regions of low-energy barriers [2]. At the same time by doping materials inside the conducting polymers, the mechanical properties are also enhanced which are also useful for the applications like sensors and actuators i.e. plastic microelectronics [3-5].

Distribution of intermolecular and intramolecular hopping rates inside the conjugated polymers makes the conductivity complex i.e. AC conductivity. The measurement of DC conductivity provides information about the distribution of individual hoping rates only and does not suggest for any concrete information about the conduction mechanism in conducting polymers. On the contrary, the AC conductivity measurements provides useful information about how the conducting polymers exhibit conductivity [6].

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Effect of nitrogen deficiency on the physiology and biochemical composition of microalga Scenedesmus rotundus-MG910488

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Abstract

The present investigation ascertains the impact of gradient concentrations of sodium nitrate on the physiology and biochemical composition of isolated microalga Scenedesmus rotundus-MG910488. The concentrations of nitrate were selected as 0, 3.5, 7.0, 10.5, 14.0, and 17.6 mM/L in BG_{11} medium. The lower concentrations of nitrogen were found to be significantly decreasing the cell count and photosynthetic activity in the microalga as well as changing cell morphology. The amount of biomass, its productivity and lipid yield were significantly affected. The highest biomass of 689.15 ± 14.27 mg/L was achieved in the concentration of 17.6 mM/L with the biomass productivity of 38.28 ± 0.78 mg/L.

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In silico studies on pyrazine derivatives for identifying potential inhibitors of PIM-1 kinase

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Anticancer, PIM-1 kinase, docking, 3D-QSAR, ZINC database.

ABSTRACT

PIM-1 kinase (PIM-1K) modulates multiple cellular functions and is evolving as a drug target for cancer. In search of potential PIM-1 inhibitors, we report herein the 3D-QSAR as well as docking studies on 3-(pyrazin-2-yl)-1H-indazole derivatives. Based on the 3D-QSAR study, the generated pharmacophore was utilized for the virtual screening of thousands of compounds (compds) from ZINC database against PIM-1K. Four top-ranked compds, ZINC05885218, ZINC05888770, ZINC08652441, and ZINC73096248, were selected by virtual screening study. The study results of molecular docking suggested that certain key residues were significant for interactions of ligand–receptor due to the formation of hydrogen bonds with Glu171, Glu121, Lys67, Asp128, Asp131 and Asp186 of PIM-1K. Virtually screened compds displayed resemblance in binding interactions within the PIM-1Ks catalytic pocket in comparison with their corresponding crystal structures. The ADRRR.2 emerged as the potential pharmacophore hypothesis and

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In vitro Cytotoxicity and Genotoxicity Assessments of Carbofuran and Malathion Pesticides on Cat (*Felis catus*) Fibroblast Cells

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Pesticides constitute a different class of chemicals, basically designed for the protection of agricultural crops by controlling a variety of insects, pests, weeds harmful for the agricultural plants. Pesticides are considered as potential chemical mutagens. Experimental data have shown that various agrochemicals have lethal effects, including mutational properties such as chromosomal changes, DNA damage, micronuclei formation or cytotoxicity in the cellular level. This study was designed to examine the cytotoxic and genotoxic effects of carbofuran and malathion pesticides on cat (*Felis catus*) fibroblast cells. The deterrent effects were assessed based on cell viability, chromosomal changes and DNA damage on fibroblast cells in approx. 1×10^5 cells. The cells were exposed to 0.045 mM - 1.08 mM of carbofuran for 24 h, and 5 mM –

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Analysis of Cognitive Radio Spectrum Sensing Techniques over Nakagami-m Fading Channel

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Abstract—**As the demand of wireless communication increases exponentially, with the same ratio scarcity of spectrum also originates. To overcome this spectrum scarcity a novel approach, Cognitive Radio (CR) shows development of an opportunistic and promising technology. This paper explores implementation and analysis of the CR spectrum sensing techniques such as Matched filtering, Energy detection and Cyclostationary feature detection on MATLAB platform by simulation. We analyze performance of these techniques over, Nakagami-m fading channel with AWGN channel for both the BPSK and QPSK modulation.**

Keywords: Cognitive Radio, Spectrum sensing, Energy detection, Matched filtering, Cyclostationary detection,Nakagami-m fading channel, AWGN channel, BPSK, QPSK

I. Introduction

Cognitive radio (CR) is an excellent development to treat the scarcity of spectrum. As the wireless communication is spreading its application exponentially at commercial as well as domestic level, dynamic spectrum allocation play an effective role to reduce the problem of spectrum scarcity [1]-[10]. In our implementation we show the performance of cognitive radio spectrum sensing techniques like Energy detection, Matched filtering and cyclostationary feature detection over the Nakagami m-fading channel. Individual performance of each sensing techniques analyzed for both BPSK and QPSK modulation. We plot the curve for SNR vs Decision accuracy for each sensing techniques although combine analysis also done for both BPSK and QPSK modulation techniques over Nakagami-m fading channel.

This paper organized as, first section introduced to our work. Matched filtering, Energy detection and Cyclostationary feature detection techniques briefly introduces in the section second, third and fourth respectively with their basic mathematical expressions. Nakagami-m fading channel discussed in the section five. Section six shows the performance of discussed spectrum sensing techniques individually. Finally section seven concluded the inferences drawn from our work.

II. Matched Filtering

Matched filtering is an optimum and most promising method of spectrum sensing. It require prior knowledge of primary user signals like operating frequency, modulation type, packet format, bandwidth and pulse shaping etc. Matched filter is a linear filter which perform coherent detection of primary user (PU) signals. In its operation it performs correlation of received primary user signal with the filter impulse response to check the spectrum is busy or idle, although its performance

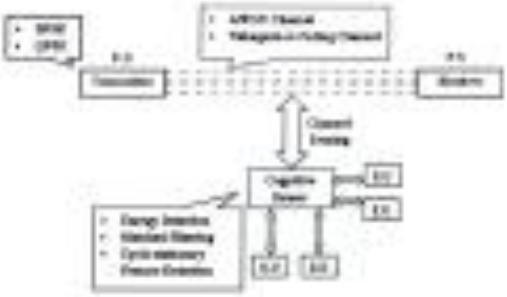

Fig. 1. Cognitive environment over propagation channels

might be weak in the absence of suitable desired primary user information. [1] - [4]. As the PU signal passes through the matched filter, it produces a peak in its output to show the presence of PU signal over sensed spectrum. At the same time it increases the signal component and decreases the noise component to maximize SNR [12].

$$Y[n] = \sum_{k=-\infty}^{+\infty} h[n-k]\,x[k]$$

Where x is unknown signal and is convolved with the h, the impulse response of matched filter that is matched to the reference signal for maximizing the SNR [1], [2], [3], [9].

III. Energy Detection

Energy detection is very simple and effective spectrum sensing technique. It is most popular and economic due to its simplicity. It is based on non-coherent detection and does not need prior knowledge of structure or signal format of PU signal. The energy detector calculate the signal energy over the desired spectrum and compare it with pre calculated threshold energy level. If the calculated energy level is found to be greater than threshold energy level, it is considered as desired spectrum is busy with PU signals. The desired spectrum is said to be free or idle when energy detector found energy level over the desired spectrum is less than threshold energy level. New CR engine can offer this spectrum to Secondary User (SU) [1]-[4],[7], [9], [10], [11], [13].

$$S_N(x) = \frac{1}{N}\sum_{n=1}^{N} s[x]^2$$

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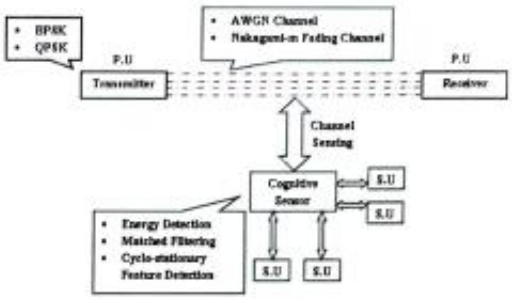

Fig. 1. Cognitive environment over propagation channels

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$$S_N(x) = \frac{1}{N} \sum_{n=-1}^{N} S(n)^2$$

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Studies on CdSe/PVK nanocomposites films for electroluminescent display applications

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ABSTRACT

In the present work, the thin films of CdSe/PVK nanocomposites with various concentration of CdSe have been synthesized by chemical route. Polyvinyl carbazole (PVK) was used as a stabilizer as well as host matrix to prevent agglomeration of nanoparticles. The synthesized CdSe/PVK films were characterized by X-ray diffraction (XRD), Field emission scanning electron microscopy (FESEM), UV–Visible absorption spectra. The crystalline size was calculated from the XRD while FESEM images confirm the surface morphology of CdSe/PVK nanocomposites. CdSe nanocrystals have hexagonal phase and size increases with increasing CdSe content, Single PL peak at 498 nm for all the samples is caused by luminescence centres or surface/defect states. The EL spectra are quite broad as compared to PL spectra and the peaks are obtained at nearly same wavelength. The EL peak intensity increases slightly and shifts towards red by increasing concentration of CdSe in polymer matrix.

1. Introduction

Electroluminescence (EL) is one of the electron transfer processes, which occurs upon the application of electric field to the specific materials. EL has been studied for organism [1] and semiconductor-based materials [2–4]. Nanocomposites thin films of II-VI compounds in polymer matrix have attracted particular attention because polymer supported materials provide higher stability and processability. It also provides new opportunities for material scientists to design new futuristic functional materials [5] and some interesting improvements caused by nanoparticles-polymer matrix interaction [6]. When the nanoparticles are embedded in polymer, it acts as surface capping agent. The control of particle size and their uniform distribution within the polymer is the key to technology based on the nanoparticles in polymers [7]. Recently, several groups have reported the use of II-VI semiconductor nanoparticles. The cadmium selenide quantum dots based polymer nanocomposites are emerging as fourth generation material for application in opto-electronics and electronics like organic solar cells [8,9] and light emitting devices [10–14], flat panel displays etc. because of their light weight, low cost of processing, low operating voltages, high brightness and efficiency, tunability of the color emission, fast response time, long life, compatibility to flexible substrates and harmless nature to the eye [15–19]. CdSe, in combination with polymers produce, a new type of optical material with very unique properties. Due to the quantum size effect, the absorption and fluorescence spectra of the Q-size semiconductor particles can easily be tuned and the fluorescence efficiency and the stability of the nanoparticles can be greatly improved by modifying the particle surface [20,21].

PVK is a blue light emitting and hole transport organic semiconducting polymer. It has outstanding physicochemical properties such as photoconductive, photorefractive, high refractive index etc. PVK is used in many application areas which are currently booming solar cell, optoelectronic devices, photovoltaic cell and luminescent devices etc. [22]. Semiconductor-PVK composites promise both the excellent carrier generation efficiency and mobility of the inorganic semiconductor and the processability of the organic polymer [23]. Increase the concentration of ZnSe in PVK matrix has resulted in an increase in luminescence intensity of PVK/ZnSe nanocomposite films [24]. Tugai et al. have reported the studies on optical properties of thin nanohybrid films based on PVK and CdSe/ZnS quantum dots [25]. Kaur et al. synthesized polymer nanocomposites (CdSe nanoparticles of average size 6–7 nm embedded in poly (N-vinyl carbazole) (PVK matrix) by ex-situ chemical method for data storage device [26]. CdSe/PVK nanocomposite shows photoluminescence due to the CdSe nanoparticles. Lee et al. [27] reported electrical and optical properties of organic light emitting device (OLEDs) fabricated from CdSe/ZnS quantum dots (QDs) embedded in a PVK layer. The photoluminescence

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RESEARCH PAPERS

Bioremediation of melanoidin contamination in distillery effluent using Aspergillus brasiliensis

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Interpolants For Degree-n Approximation Over Convex Polygons*

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Lakshmi Narayan Mishra¶

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Abstract

Wachspress' coordinates are a generalization of barycentric coordinates to convex polygons with four or more vertices. These coordinates, which were introduced in the context of the finite element method correspond to rational functions in which the polynomial denominator is popularly known as the adjoint. Corresponding to each element of the discretization, a class of Wachspress coordinates is defined such that each class has a unique adjoint depending on the geometry of the element. In this paper, an interesting property of Wachspress coordinates is investigated, viz."two wedge functions which are linear on the common adjacent side of the polygon, attain the same value at the mid point of that side". Applying this property, a more general form of Dasgupta's recursive relation is derived. Moreover, this method is extended to the polynomial approximation of higher degree over a polygon of any order. A Mathematica program is also developed in view of the above assertions which enhance the application of the devised tool.

1 Introduction

Partial differential equations play a key role in solving problems of mathematical physics in particular, related to shapes or physical properties like conductivity, elasticity, stokes flow, etc. Since, in many cases, analytical or exact solutions to these partial differential equations can be impossible or expensive to obtain, the process of simulation is adopted to find approximate solutions [1, 17]. The idea of a test function whose functional properties are already known were initiated by Galerkin [5, 9] for the simulation process. Later with the aid of computers this idea was extensively applied on larger domains such as computation of stress/strain for multi-storied buildings, for ships to study the sustainable conditions in all types of atmospheric variations, bridges, aerospace engineering [6, 14, 2], etc. Nowadays, the finite element method (FEM) is the most widely used simulation technique, and is applied in almost all branches of science and technology, whether it is computer graphics [7], computer vision [20], image processing [18], computational mechanics [7] or prediction of some unknown information [10, 16], to name a few applications.

In order to simplify the process of approximation, several tools were developed by the researchers including the most popular tool of barycentric coordinates initially proposed by Möbius [13]. This tool has enormous applications in the filed of computer aided designs [7], but it is restricted to an n-simplex in n-dimensional Euclidean space. It is known that barycentric coordinates possess the following properties:

- Partition of unity.
- Linear reproduction property.
- Non negativity.

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Fracto-mechanoluminescence of ZrO_2:Ti nanophosphor excited by impulsive excitation

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Crystalline and Absorption Studies on Cadmium Sulphide doped Polycarbonate Composite

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Abstract. In this paper we have studied the preparation of composites of polycarbonate composite by incorporating Cadmium Sulphide(CdS) particles with different concentration. The prepared samples were characterized by the different techniques used like X-ray diffraction (XRD) techniques and UV-visspectroscopy(UV-Vis). The X-Ray diffraction technique gives the information on Crystallinity of the Sample, InterplanerDistance (d) and Crystallite Size (D). When the doping concentration is increased the crystallinity of the sample is increases and Crystallite size(D) is also increases. The UV-Vis spectroscopy technique gives information of Optical Band Gap. The energy band gap of pure polycarbonate is 4.437 eVand as we increase the concentration of cadmium sulphide the energy band gap decreases.

INTRODUCTION

Polycarbonate(PC) is an amorphous and polar thermoplastics polymer. It is used as engineering material because it has several properties such as transparency, dimensional stability, flame resistance, high heat distortion temperature and high impact strength[1]. Polycarbonate is soft in nature and the surface of polymer is easily stretched.It is used in electronic and electrical applications and has quite good insulation characteristics. Cadmium sulfide is an important II-IV group element semiconductor(at room temperature)with many excellent physical and chemical properties. This has promising application in multiple technical fields including photochemical catalysis, gas sensor, detectors for laser and infrared.

EXPERIMENTAL DETAILS

Material Used in Present Study

The polycarbonate with molecular weight 45.0Mw, from Company Acros Organics, New Jersey USA.Cadmium Sulphide(orange in colour), molecular weight 144.48 99% pure fromResearch Lab Fine Chemical Mumbai, India.

Preparation of Samples

The solvent cast technique was adopted for preparation of pure and composite samples. The specimen of pure PC, 0.2%CdS+PC, 0.4% CdS+PC, 0.6% CdS+PC, 0.8% CdS+PC, 1.0% CdS+PCin the presence of Chloroform as a solvent. The solution was constantly stirred with the help of electronics stirrer for 2hrs at room temperature and sonicated to obtained homogeneous solution. The prepared solution was poured on glass Petri disk. The film were kept at room temperature for overnight and then films were then removed from Petri disk and stored in air tight polyethylene begs for further characterization.

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ARTICLE

Designing Cellulose Acetate - Polyacrylamide Semi-Interpenetrating Polymer Networks and Evaluation of their Protein Retention Behavior

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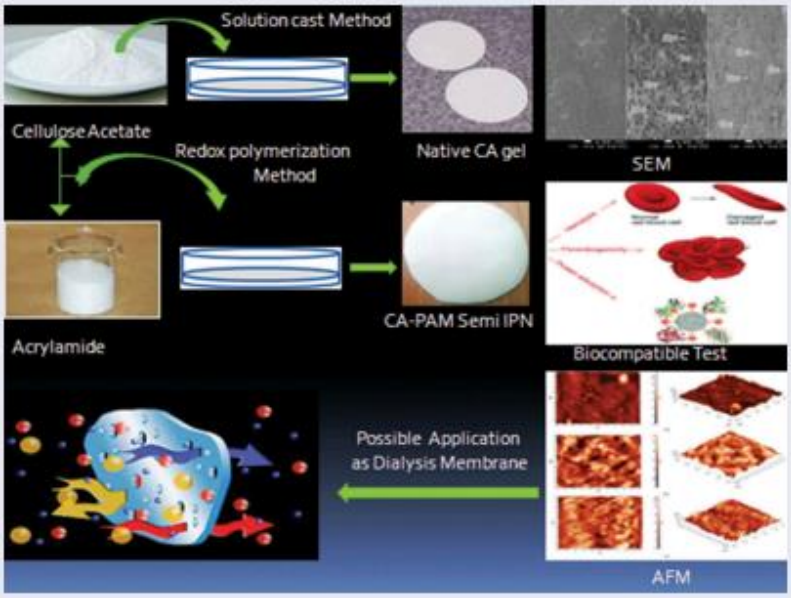
ABSTRACT

In this work semi-IPNs of cellulose acetate (CA) – N, N'- methylene bisacrylamide (MBA) – cross-linked polyacrylamide (PAM), and native CA gel were prepared and characterized by FTIR, AFM, SEM, XRD, TGA and DSC techniques. The AFM studies revealed that addition of AM increased the symmetry of the semi-IPN surfaces whereas the XRD spectra suggested for a decrease in crystalline nature of CA. The network parameters were changed with change in concentrations of CA and AM. The prepared semi-IPNs were examined for retention of bovine serum albumin (BSA). The mechanical properties, swelling capacity, % porosity and biocompatibility were also investigated.

KEYWORDS

Dialysis; semi-IPNs; protein retention; SEM; FT-IR; swelling study



Introduction

IPNs are defined as a polymer network formed by the combination of two polymers, of which at least one is synthesized and/or crosslinked in the immediate presence of the other without forming any covalent bonds between them [1]. If one of the components of these IPNs has a linear structure instead of network, it is called semi-IPN. Semi IPNs have been employed in many industrial and biomedical fields because of their better mechanical strength, good compatibility and swelling tendency in water and biological fluids [2, 3].

In recent years, dialysis membranes have been investigated for their properties such as sieving ability [4], diffusive permeability, and pore size distribution [5, 6].

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Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/lpte.

Dielectric Relaxation Behaviour of (Poly (Vinyl Formal)) (PVFO) and Polyvinylidenefluoride (PVDF) Blends

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Abstract. Thermally stimulated discharge currents in PVFO: PVDF blend samples of weight percentage ratio 80:20 and 95:05 prepared by the solution cast technique have been studied as function of polarizing temperature. Three distinct peaks are found at 60±10, 100±10, and 140 ±10 °C respectively. Activation energy values been calculated by initial rise method and it were found to range from 0.22 to 1.0 eV.

INTRODUCTION

In recent years considerable attention has been shown to the study of polymeric blends. A proper selection and combination of polymeric components in an appropriate ratio might result in a material with optimal properties for specific applications in microelectronics and engineering.

Many techniques including thermal analysis and scattering methods have been used to look at microscopic and macroscopic phenomena with regard to morphology crystallization and interfacial properties. TSDC is a powerful technique with sensitively comparable to dynamic mechanical and dielectric loss measurements. Further, for semicrystalline materials, the low equivalent frequency offers one additional advantage. The glass transition temperature Tg is shifted to low temperature and the glass transition of the purely amorphous phase can be studied without inducing crystallization [1-9]

Hence in the present investigations, an attempt has been made to study the charge storage mechanism in a weakly polar substance (poly (vinyl formal)) (PVFO) and a semi crystalline polar Polyvinylidenefluoride (PVDF) blends in ratio PVFO: PVDF:: 80:20 and 95:05.

EXPERIMENTAL

The commercial and PVFO and PVDF used in the present study supplied by Redox Ltd. (India).The samples for the present investigation were prepared by the solution cast technique. Blend samples of wt% compositions PVFO: PVDF:: 80:20; 85:15; 90:10 and 95:05 were prepared.

For TSDC measurements bimetallized samples were polarized with fields of 100, 150, 200 and 250 $kVcm^{-1}$ at temperatures 60, 75, 90 and 105^{0}C. After polarizing for 45 min at the desired temperature, the sample was cooled to room temperature in the presence of field. The total time of polarization was adjusted to be 90 min in each case. The TSDC in short circuit of the samples thus charged were obtained by reheating the samples at linear rate of approximately 3^0Cmin^{-1} and the depolarization current was measured by means of a sensitive electrometer Keithley Electrometer (610 C).

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Synthesis and Crystalline Properties of CdS Incorporated Polyvinylidene Fluoride (PVDF) Composite Film

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Abstract. This paper gives an insight on the synthesis and crystalline properties of Polyvinylidene Fluoride (PVDF) (host matrix) composites impregnated with Cadmium Sulphide (CdS) using Dimethyl formamide (DMF) as the base, prepared by the well known solvent casting technique. The effect of doping concentration of CdS in to the PVDF matrix was studied using X-ray diffraction technique. The structural properties like crystallinity C_r, interplanar distance d, average size of the crystalline region (D), and average inter crystalline separation (R) have been estimated for the developed composite. The crystallinity index, crystallite size and inter crystalline separation is increasing with increase in the concentration of CdS in to the PVDF matrix while the interplanar distance d is decreasing.

INTRODUCTION

The attention of scientists is acquired by polymers due to their technological applications and various properties [1]. Polymers have significant potential in various aspects as a result of their versatile properties. Polymer materials have been widely used in various fields such as industrial products. They also have potential advantages for applications in optical storage systems, such as high thermal stability, low absorption loss and the ability of refractive index changing upon exposure to light [2].

PVDF is a crystalline fluorinated thermoplastic of very high purity which exhibits excellent chemical resistance to mineral and organic acids, hydrocarbons and solvents. It's mechanical toughness, very low moisture absorption, wide range of service temperature from -40^{0}C to 150^{0}C, good wear resistance, low coefficient of friction, resistance to UV, self extinguishing nature and transparency to radiation renders it useful in host of applications in chemical processing, food, pharmaceutical and paper manufacturing [3]. Polyvinylidene Fluoride (PVDF) has outstanding properties such as high thermal stability, good chemical resistance and membrane forming properties due to these it has been extensively applied to scientific research and industrial processes. PVDF exhibits four crystalline phases α, β, γ, δ [4, 5, 6].The present paper reveals the effect of doping of CdS in PVDF on crystalline properties.

EXPERIMENTAL DETAILS

Material Used in Present Study

Dimethyl formamide was purchased from Thomas Baker (Chemicals) Pvt. Limited, Mumbai – 400 002, India. Cadmium Sulphide was purchased from Research-Lab Fine Chem Industries, Mumbai - 400 002, India. PVDF was purchased from Himedia Chemical, Mumbai and used without further purification.

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METHODOLOGIES AND APPLICATION

Comparison of AHP and fuzzy AHP models for prioritization of watersheds

Sarita Gajbhiye Meshram[1] · Ehsan Alvandi[2] · Vijay P. Singh[3,4] · Chandrashekhar Meshram[1]

Abstract
Prioritization of watersheds for conservation measures is essential for a variety of functions, such as flood control projects for which determining areas of top priority is a managerial decision that should be based on physical, social, and economic characteristic of the region of interest and the outcome of past operations. The objective of this study therefore was to investigate morphological characteristics and identify critical sub-watersheds which are liable to be damaged, using remote sensing/geographical information systems and multi-criteria decision-making methods AHP/FAHP. Fourteen morphometric parameters were selected to prioritize sub-watersheds using an analytical hierarchical process (AHP) and a fuzzy analytical hierarchical process (FAHP). Based on the FAHP approach, sub-watersheds, as vulnerable zones, were categorized in five priority levels (very high, high, medium, low, and very low levels). The conservation and management measures are essential in the high to very high levels categories. Thus, the FAHP approach is a practical and convenient method to show potential zones in order to implement effective management strategies, especially in areas where data availability is low and soil diversity is high. Finally, without having to encounter high cost and a waste of time, sub-watersheds can be categorized using morphometric parameters for implementing conservational measures to simultaneously conserve soil and the environment.

Keywords Watershed · Prioritization · Analytical hierarchical process · Selection criteria · Fuzzy analytical hierarchical approach

1 Introduction

A watershed is a physically complex system. It consists of a number of unit source areas (having approximately uniform properties), and partial and variable source areas each exhibiting a different response (Meshram et al. 2018a, b). The juxtaposition of different source areas of contrasting topography, rock type, and land use and soil characteristics result in areal variations in watershed processes and response. Every hydrologic design is therefore different because the physical properties often vary with site (Gajbhiye and Sharma 2017).

Geomorphological parameters directly or indirectly reflect nearly the entire watershed-based causative components influencing runoff and sediment loss (Meshram et al. 2017a). In this manner, without huge hydrological data, morphometric parameters along with satellite-based land use-land cover information of watersheds might be helpful in prioritizing sub-watersheds. In particular, for ungauged or inadequately gauged watersheds, a morphometric analysis can be desirable, because it can establish relationships between different aspects of the drainage basin. It may also help with the evaluation of different drainage basins from different climatic and geologic regimes (Meshram et al. 2017b).

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< Biotechnology and Biological Sciences (https://www.taylorfrancis.com/books/mono/10.1201/9781003001614/biotechnology-biological-sciences?refId=2b59436e-dd68-47bb-8349-37d0796843ae&context=ubx)
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Chapter

Far ranging antimicrobial and free radical scavenging activity of Himalayan soft gold mushroom; Cordyceps sp.

By Loknath Deshmukh, Rajendra Singh, Sardul Singh Sandhu

Book Biotechnology and Biological Sciences (https://www.taylorfrancis.com/books/mono/10.1201/9781003001614/biotechnology-biological-sciences?refId=2b59436e-dd68-47bb-8349-37d0796843ae&context=ubx)

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ABSTRACT

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Next Chapter > (chapters/edit/10.1201/9781003001614-51/extraction-characterization-siderophores-pseudomonas-sp-assessing-pgpr-activity-pseudomonas-sp-dhavalkumar-patel-mahima-patel-shallee-patel-bhavya-kansara-dweipayan-goswami?context=ubx)

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METHODOLOGIES AND APPLICATION

An identity-based encryption technique using subtree for fuzzy user data sharing under cloud computing environment

Chandrashekhar Meshram[1] · Cheng-Chi Lee[2,3] · Sarita Gajbhiye Meshram[1] · Muhammad Khurram Khan[4]

Abstract
The advancement of the cloud storage technology opens up a wide range of possibilities for adaptable data sharing. When sharing data to an extensive number of users with fuzzy identities, the data proprietor must use an appropriate identity-based encryption technique that satisfies both efficiency and security prerequisites. Identity-based encryption is a promising possibility to ensure fuzzy user data sharing while meeting the security essentials; however, it may encounter efficiency trouble in multi-receiver settings. Recently, identity-based encryption has received much attention, and most of the research has aimed to apply the technique in real-world systems. A major concern about using identity-based encryption is the safety of the private keys, as disclosure of secret keys requires the reissuing of encryptions already doled out. The capability to minimize the risks associated with key disclosure is particularly important due to the increased use of mobile and unprotected devices. In this article, we shall propose a forward-secure identity-based encryption technique based on subtree for fuzzy user data sharing under cloud computing environment, and we shall demonstrate that the technique is semantically secure against a chosen subtree and chosen ciphertext attack (IND-CST–CCA). In addition, we will show the superiority of our new technique over the currently existing methods in terms of security and the length of public key. Then, we will also discuss the potential of our new technique to be deployed in pay TV systems and grid security.

Keywords Identity-based encryption · Cloud storage · Subtree · Bilinear pairings · Random oracle · Pay TV system · Grid security

1 Introduction

Cloud storage has brought new ways of storing, retrieving, and sharing digital data, turning the idea of on-request data sharing into reality. These days, there have been large-scale mergers among smaller cloud storage service providers into cloud specialist co-ops or cloud data centers that offer data sharing service at nominal cost. With the help of cloud storage, an agent in a business can readily obtain valuable data or share the latest information with the headquarters, associates, or subordinates in an on-request way anytime anywhere. This fundamentally enhances the efficiency in data exchange and processing and brings down communication costs.

However, easy and swift accessibility is oftentimes a synonym of security vulnerability when it goes to the

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Bioelectricity Potential through Plant Microbial Fuel Cell System using by *Cynodon dactylon* (Dooba ghas)

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Abstarct

In these times electricity is big trouble of problem facing by the world. Therefore, there is necessitating for the property basis of energy that is employed for as bio-electricity. Many of the scientists and researchers are trying to find out the sustainable energy generates with the help of plant microbial fuel cell. Plant microbial fuel cell (P-MFCs) could be feasibility technology approach of bio-electricity generation which is mutualism interaction of the plants along with their rhizospheric bacteria. In the present study, Plant-microbial fuel cell was observed in grass *e-table* evaluated in term of bioelectricity generation from *Cynodon dactylon* (Dooba Ghas). This *e-table* was connected with electrode and different condition (physical and chemical) to detect the change in bioelectric potential. It was found that maximum voltage generated among all the conditions was 4.24 ±2V at 15 days by using *Cynodon dactylon* through P-MFCs. The potential difference generated through P-MFCs was measured using a multimeter. The generation of bioelectricity was observed under different conditions like exposure to light and shade condition measured for voltage was found to be significantly different parameters. The maximum recorded under light and shade conditions were 3.82 ±2 V and 4.25 ±2 V respectively at 15 days of incubation.

Key-words: P-MFCs; *Cynodon dactylon*; energy; bioelectric potential; electricity generation.

1. Introduction

Now day's energy has highly demand for production of energy it's required a large amount of non-renewable resources. These are resources like coal, petrol and wooden etc. causes the

biomolecules

MDPI

Review

Fisetin and Quercetin: Promising Flavonoids with Chemopreventive Potential

Dharambir Kashyap [1], Vivek Kumar Garg [2], Hardeep Singh Tuli [3,*], Mukerrem Betul Yerer [4], Katrin Sak [5], Anil Kumar Sharma [3], Manoj Kumar [6], Vaishali Aggarwal [1] and Sardul Singh Sandhu [7]

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Abstract: Despite advancements in healthcare facilities for diagnosis and treatment, cancer remains the leading cause of death worldwide. As prevention is always better than cure, efficient strategies are needed in order to deal with the menace of cancer. The use of phytochemicals as adjuvant chemotherapeutic agents in heterogeneous human carcinomas like breast, colon, lung, ovary, and prostate cancers has shown an upward trend during the last decade or so. Flavonoids are well-known products of plant derivatives that are reportedly documented to be therapeutically active phytochemicals against many diseases encompassing malignancies, inflammatory disorders (cardiovascular disease, neurodegenerative disorder), and oxidative stress. The current review focuses on two key flavonols, fisetin and quercetin, known for their potential pharmacological relevance. Also, efforts have been made to bring together most of the concrete studies pertaining to the bioactive potential of fisetin and quercetin, especially in the modulation of a range of cancer signaling pathways. Further emphasis has also been made to highlight the molecular action of quercetin and fisetin so that one could explore cancer initiation pathways and progression, which could be helpful in designing effective treatment strategies.

Keywords: apoptosis; cell cycle arrest; extracellular matrix remodeling; epithelial to mesenchymal transition; signaling cascades; flavonoids; fisetin; quercetin

1. Introduction

The incidence of malignant diseases and the prevalence of cancer mortality is proliferating at an amplified rate across the developed and developing countries [1]. New Globocan 2018 cancer data from 185 countries documented 18.1 million new cancer cases and 9.6 million cancer-related deaths (GALOBOCAN 2018). Although the improvement of diagnostic tools, advanced treatment approaches, and cancer awareness programs have resulted in a remarkable drop in cancer mortality in the United States, cancer prevalence is still growing continuously [1]. This is attributed to smoking

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Opto-electronics properties of starch capped CdSe nanoparticles

Sarita Kumari[1] · Meera Ramrakhiani[1]

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Abstract
The nanoparticles of a prominent luminescent material, cadmium selenide (CdSe) have been prepared by simple wet chemical route using starch as capping agent. The X-ray diffraction of the synthesized CdSe nanocrystals exhibits hexagonal phase with average crystallite size decreasing with capping agent concentration. Surface morphology of CdSe nanoparticles has been studied using scanning electron microscopy. The UV–Vis absorption shows blue shift in absorption edge indicating increased band gap with decreasing the particle size due to quantum confinement. The photoluminescence and electroluminescence (EL) measurement show single peak at about 650 nm with increasing intensity for smaller nanocrystals, however emission peak is quite broad in case of EL indicating involvement of impurity states. The luminescence intensity increases because of increased oscillator strength and the better passivation of the surface defects responsible for non-radiative relaxation process. The light emission starts at lower threshold voltage when the concentration of capping agent is increased.

1 Introduction

Recently, nanostructured semiconductor materials have received great importance in fundamental as well as applied research, due to their promising size dependent properties (optical, electronic properties) [1, 2]. If band gap of the semiconductor increases as the size of particles decreases, thus the phenomenon of size dependence of the band gap in semiconductor is an important aspect of quantum confinement. Generally, blue shift in absorption spectrum is observed due to the quantum confinement when the dimensions of particles become equal to the exciton Bohr radius. Therefore the effective mass model is mostly used to estimate the size dependence optical and electronic properties of quantum dots (QD) [3]. Because of the high surface area of nanoparticles, the surface defects play a crucial role in their quantum efficiency (QEs). Such shape and size dependent features of nanoparticles may provide a better scope for the development of new composite materials with optimized properties for different optoelectronics applications [4–10]. Today much investigation have been carried out by the researchers to prepare of QDs for devices purpose, but the relaxation dynamics of the electronic states in QDs remain an open fundamental debate. These QDs combine advantageous properties of polymers with size-tunable optical, electronic and other properties of semiconductor nanoparticles. The role of the polymers is to encapsulate the nanoparticles and enable better exploitation of their characteristic properties. However, polymer can also be used to modify the surface and to control the growth of nanoparticles. Also, the carriers' dynamics in nanoparticles significantly differ from bulk materials due to their large energy gap and increase in surface-to-volume ratio. There are different types of nanoparticles such as CdS, ZnS, CdTe which has been synthesized and proposed for display applications [11–13]. In past Wuister et al. [14] reported the optical properties of silica capped CdS nanoparticles and investigated the electron–hole trapped states involved in the recombination process. Also, Creti et al. [15] studied the effect of surface and interface defects on the optical properties of CdSe nanocrystals by ultrafast spectroscopy. It is well known that CdSe has the absorption edge at around 690 nm and it corresponds to the band gap of 1.8 eV and it is used in multicolor fluorescent markers in biological systems [16]. Also they show better electroluminescence (EL) properties when dispersed in a suitable polymer matrix, which is applicable for multicolor displays applications [17]. Thus organic light emitting diodes (OLEDs) and quantum dots light emitting diodes (QLEDs) are the promising light sources of twenty-first

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Investigation of Electrical Conduction in Polysulfone-Polyvinyledene Fluoride Blends at High Temperature and Field

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Abstract. In the present investigation current-voltage (I-V) characteristics of the blends of Polysulfone –Polyvinyledene Fluoride in different composition (PSF: PVDF:: 80:20; 85:15; 90:10 and 95:05 percent by weight) were investigated at different fields, range 100-250 $kVcm^{-1}$, as a function of temperature, range 333-388 K. The results based on these isothermal I-V characteristics indicate thermally activated conduction main in the entire temperature range. This complete absence of Ohmic region is due to the fact that all the measurements has been carried out at high temperature and with high field. To distinguish between Richardson Schottky (R-S) and Pool Frenkel (P-F mechanism), help of β factor obtained from the slope of log I versus $E^{1/2}$ plots is generally taken. In our case β experimental is close to the value of β (P-F) calculated theoretically. Hence Pool Frenkel mechanism seems more favourable in this case. The activation energy values for the different blend sample at various field has been calculated by the slope of log I versus 1000/T. Values of Activation energy indicate that the conduction process is due to electronic conduction mechanism.

INTRODUCTION

Electrical conduction in polymeric dielectrics results not only from transportation of free charge carriers present in the bulk of polymer but also from a number of different conduction processes taking place simultaneously depending upon the experimental conditions. Since the structure of these materials is sensitive to their electrical, mechanical and thermal histories, the modes of conduction differ from polymer to polymer and the sensitivity of measurement is different in different materials. When subjected to different conditions they often undergo structural transitions making carrier generation and transport phenomenon more complicated. No universally accepted theory is available till date which can explain conduction phenomenon in all the polymeric dielectrics. However, attempts have been made to explain the observed conduction behaviour on the basis of various existing theories and hypothesis.

Different scientists have attempted to explain the dark conduction in polymers in their own way, such as trap and their energy distribution [1], tunneling of charge carriers [2]. schottky emission [3], avalanche breakdown [4], etc.

Polysulfone and Polyvinyledene fluoride is one such important blend. Polysulfone are a class of amorphous engineering polymer with excellent thermal, mechanical, chemical and hydrolyte stability [5].

PVDF on the other hand is a semicrystalline polymer which has drawn both scientific and technological attention because of its useful piezo and pyro-electric properties. It is also one of the rarest polymer that diverse crystalline forms at least five phase namely α, β, γ, δ and ε [6].

Electrical behavior of polymeric blends of PSF and PVDF containing higher percentage of PVDF has been investigated by Saxena *et. al* [7-8]. They studied conduction mechanism for low field and temperature. It, however, appears that the conduction mechanism of such blends in different compositions is not completely understood. Further, such studies on these blends are still sparse for higher field and temperature [9].

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Evaluation of DC and AC Conducting Properties of Poly (diaminonaphathalene) Conjugated Polymer Doped in Poly (vinyl alcohol) Films

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Abstract. Poly (diaminonaphthalene) doped poly (vinyl alcohol) was synthesized by in-situ chemical oxidation polymerization method. The complex conduction mechanism of obtained PDAN doped PVA films were examined by measuring DC and AC conductivity. Non-linear I-V characteristics curve confirming the semiconducting nature of the films at constant temperatures. The DC and AC conductivities of the 0.791g PDAN doped PVA films were $(2.041\pm0.64)\times10^{-5}$ Scm^{-1} and $(6.28\pm0.79)\times10^{-6}$ Scm^{-1}, respectively. The DC conductivity so obtained was six folds larger than earlier reported.

INTRODUCTION

In order to understand and analyze the mechanism of conduction in the polymeric nanocomposites one has to seek insights into the fact that how the electrical conductivity varies with temperature and frequency. There are four conditions that are responsible for the conductivity of the polymer materials, viz, the existence of charge carriers, overlapping of molecular orbitals to result in carrier mobility, mobility of π -bonds and charge hopping between polymer chains [1].

Direct Current (DC) conductivity measurements provides valuable knowledge about the impurities, nature of current carriers and scattering effect of the conducting polymers. The measurement of alternating current (AC) is a significant experimental tool that helps in exploring microscopic images of disordered systems. These techniques are of immense technological and fundamental applications. The complete studies of conducting mechanism related to applied voltage, temperature and applied frequency for polymeric materials provide to understand the electrical phenomena for their use as electrical appliances. The mechanism of charge transport for the charge carriers at low frequencies or direct current depends on intra-chain connection of the conducting polymers whereas at high frequencies the charge carriers become localized in small regions of low-energy barriers [2]. At the same time by doping materials inside the conducting polymers, the mechanical properties are also enhanced which are also useful for the applications like sensors and actuators i.e. plastic microelectronics [3-5].

Distribution of intermolecular and intramolecular hopping rates inside the conjugated polymers makes the conductivity complex i.e. AC conductivity. The measurement of DC conductivity provides information about the distribution of individual hoping rates only and does not suggest for any concrete information about the conduction mechanism in conducting polymers. On the contrary, the AC conductivity measurements provides useful information about how the conducting polymers exhibit conductivity [6].

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Microhardness study of binary blend of Polyvinyl Formal and Polyvinyledene Fluoride

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Abstract. The preparation of polymer blends of Polyvinyl Formal and Polyvinyledene Fluoride in different weight percentages is described. The strength of these blends has been studied by measuring their surface microhardness making use of a Vickers microhardness tester.

INTRODUCTION

It has been recognized that the useful physical properties of polymers depend not only on the chemical structure but also on their supermolecular organization [1-2]. Polymers are characterized by a large number of intermediate stages of ordered arrangement of chains i. e. the existence of various levels of supermolecular organization which intervene between the crystalline and completely amorphous phases. Studies on polymeric blends, is therefore, important from the point of view of understanding morphology- property relationship or properties in relation to the crystalline and amorphous content of the polymer. The morphology of a polymer blend can be tailored and it is, therefore, possible to achieve a host of properties which cannot possibly be obtained by homopolymers alone.

Many polymeric blends have been found and reported over the last few decades [3]. A polymeric blend of Polyvinyl Formal (PVFO) and Polyvinyledene Fluoride (PVDF) is one such important blend. Polyvinyl Formal is a class of weakly polar polymer with excellent thermal, mechanical, chemical and hydrolytic stability, though it is hydrophobic. The polymer has been a material of interest for researchers for many years [4].

PVDF on the other hand is a semicrystalline polymer which has drawn both scientific and technological attention because of its useful dielectric properties and remarkable piezo-and pyro-electric properties. It is also one of the rarest polymers that exhibits diverse crystalline forms having at least five phases namely α, β, γ, δ and ε [5].

Microhardness testing has been utilized to obtain information on structural features and mechanical property changes for polymer blends. Further, the important aspect of the microhardness testing of polymers at low loads is that whether the hardness number is dependent or independent of the load [6-7]. It is with this view the effect of load on the microhardness of PVFO and PVDF polyblends have been studied.

EXPERIMENTAL

The commercial PVFO (*Powder*) and PVDF (*Powder*) used for the present study were procured from Solvay Corp. Ltd, Belgium and supplied by Redox Ltd. (India). The samples in the present investigation were prepared by the solution cast technique [8]. The solution of particular concentration was prepared by dissolving the two polymers PVFO and PVDF in different weight ratios in their common solvent N, N, Dimethyl formamide (DMF) at 80°C. This solution was then poured on clean optically plain glass plates kept on a mercury pool in a dust free oven at a constant temperature, $T = 80^{0}$C, for 5 hr to yield blend films which was then peeled off from the glass plates [9]

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ASSESSMENT OF ROOT COLONIZATION BY VAM FUNGI IN VEGETABLE PLANTS IN CENTRAL INDIA

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ABSTRACT

In the present study, nine vegetables of four family namely as Amaranthaceae, Cucurbitaceae, Poaceae and Solanaceae were observed for maximum colonization of Arbuscular mycorrhizal (AM) fungal. The highest rate of colonization was observed in *Solanum melongena* belong to Solanaceae followed by *Solanum lycopersicum* (Solanaceae), *Allium cepa* (Amaryllidaceae) and minimum was observed in case of *Cucumis sativus* (Cucurbitaceae). The seedlings of the test plants were treated with AM fungi and the vesicle formation were observed in case of all seedlings, but arbuscule was detected only in onion and brinjal. The maximum average of colonization percentage was also recorded during the study and the highest frequency was showed in Solanaceae family about 93.47% and minimum was found in Cucurbitaceae family about 66.7%. This study first time observed the maximum AM colonization with vesicle in *S. oleracea* (Amaranthaceae).

KEYWORDS: Biofertilizer, Myco-rhizosphere, Growth promoter, population.

INTRODUCTION

Arbuscular mycorrhizal (AM fungi) associations are the most frequent symbioses found in nature because of their broad association with plants and cosmopolitan distribution (Harley and Smith, 1983; Verma, 2010). These are beneficial soil inhabiting fungi that establish symbiotic association within the roots of plants. AM fungi create relationship within the extracellular spaces of root cortical tissues and increase the uptake of water, phosphorus, nitrogen and micronutrient in the host plant (Brundrett, 1991). AM fungi benefits host plant not only by improving nutrient uptake but also by increasing production of growth hormones, *etc*. Several plants colonized by AM fungi showed increased advantages include drought tolerance, activation of plant defense mechanism, increased growth, reduced pathogen pressure and general benefits to plant health (Brundrett, 1991; Verma and Jamaluddin, 1994; Mukerji *et al*., 1996). It's also provides a useful measure of relative soil quality and health (Klingeman *et al*., 2002).

The association of mycorrhiza in environment is ubiquitous like aquatic plants (Seerangan and Thangavelu, 2014), freshwater (Miller, 2000), wetlands (Bauer *et al*., 2003), agriculture land (Hedlund and Gormsen, 2002), forest land (Devi *et al*., 2017), degraded land (Verma and Verma, 2017), garden soil (Johnson *et al*., 1992), forest Nursery (Verma and Verma, 2016; Verma *et al*., 2016; Verma *et al*., 2017). These were indicates that the biology and ecology of this association deserves further research, especially with respect to the role of fungi in plant nutrition and tolerance of habitat conditions. Now a day's application of AM fungi during raising seedlings is helpful for growth of different seedling in nurseries condition (Verma and Verma, 2016; Verma *et al*., 2016; Verma *et al*., 2017). In the present investigation, cucumber, Wheat, Onion, Spinach, Eggplant, Garlic, Chilli, Red chaoli and Tomato were selected. These were widely cultivated and used in Indian traditional medicine since ancient times. All have medicinal properties like low in calories, antidiabetic, lipid lowering, antioxidant activity, several bioactive compounds, proteins, carbohydrate, source of multiple nutrients and dietary fiber and amount of nutrients, including iron; calcium; magnesium; amino acids; and vitamins A, C and E (Howard *et al*., 2000; Mattina *et al*., 2003; Khan *et al*., 2010; Cicatelli *et al*., 2010; Bois *et al*., 2005; Huang *et al*., 2011; Wilde *et al*., 2009; Okigbo *et al*., 2009; Berruti *et al*., 2015; Gutjahr and Paszkowski, 2013; Kumar *et al*., 2013; Mauseth, 2014).

MATERIALS AND METHODS

Survey and sample collection

Soil sample were collected from campus of Rani Durgawati University, Jabalpur according to Parkinson, (1979). A soil auger used which as washed thoroughly before starting of sampling procedure. The sampling was done in 10-20cm depth in soil horizon and collected in polyethylene bags tied with rubber bands and brought to the laboratory (Clayton *et al*., 2009). Sample were homogenized and stored at 4ºC for further use. Soil sample was sterilized with 30% formaldehyde solution.

Collection of seeds and surface sterilization

To conduct pot experiment seeds of Cucumber, Wheat, Onion, Spinach, Brinjal, Garlic, Chili, Tomato and Red chaoli were collected from seed stored shop, Jabalpur, healthy seeds were sorted and surface sterilization was done by using 1% sodium hypochlorite (NaOCl) solution for 10 minutes and after that sample was washed three

Short Circuit Depolarization Behaviour of PVDF and PVAc Blends

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Abstract Depolarization current spectra of PVDF and PVAc has been studied as a function of polarizing field, polarizing temperature and film compositions. Blends samples of PVDF and PVAc with different weight percentage :80,20 ; 90,10 and 85,15 were prepared by solvent Cast technique .The sample were bilaterally aluminized. TSDC currents on such bilaterally aluminized samples were recorded by reheating the sample at the rate of 3˚C per minute .Depolarization current were recorded by using Kheithely electrometer 610C. The various observed peaks in the thermograms are discussed on the basis of space charge polarization. The Activation energy is evaluated from the Garlick–Gibson plot of initial rise method.

Key words: Polyvinyl Acetate (PVAc), PVDF, TSDC, Electrical properties , Activation energy.

INTRODUCTION

Polymer blending is a useful method for designing materials with a wide variety of properties by changing the composition of polymers. A number of investigations have been reported for blending of polyvinylidene fluoride (PVDF), some alkyl acrylate and methacrylate polymers **[1]**, and various oxygen-containing polymers **[2]**. In particular, the blending of PVDF and polyvinyl acetate (PVAc), has been studied rather extensively and is known to be a typical miscible blend of crystalline and amorphous polymers over a wide range of composition **[3]**. Many blend electrolyte systems have been reported based on PVAc-PVDF .

PVDF contains approximately equal amount of amorphous and crystalline components. The amorphous region plays little role in macroscopic electric properties. The crystalline component may exist in four different phases: α, β, ϒ and δ . The β-phase is the most electrically active and the most important in piezoelectric applications of PVDF **[4]**.

Among the various polymers Poly(vinyl acetate) (PVAc) offers good mechanical stability, low glass transition temperature and easy film formation properties. PVAc is an amorphous polymer whose glass transition is near room temperature. It is often used as a standard for experimental measurements and to test current theories of dielectric relaxation **[5-6]**.

EXPERIMENTAL METHOD

The PVDF and PVAc used for the present study were procured from M/S Redox (Jabalpur) and were used as supplied. The sample were prepared by solvent cast technique. For preparing the samples calculated amounts of PVDF and PVAc were dissolved in DMF and toluene respectively at constant temperature 60˚c using magnetic stirrer for one hour. The two uniform solution obtained were then further stirred at constant temperature 60 ˚c for three hours solution was then poured on plane glass plates floating over mercury pools kept inside the oven and the solvent was allowed to evaporate for four hour at 60˚C .Then films so obtained was detached from glass plate. The films of equal

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Structural –Morphological relative study of Polyphenylene Oxide and Polystyrene (PS: PPO) polymer blends

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Abstract. The objective of this research paper is to compare the structural and morphological characteristic of polymer blends of Poly (Phenylene Oxide) (PPO) and Poly (Styrene) (PS). A polymer blend is a mixture of two or more polymers that have been blended together to generate a new material with different physical properties. PPO and PS have a chance to give complementary properties to each other and hence there is a huge interest in studying the PPO: PS polymer blends. With these objectives, the present work focuses on the synthesis and characterization of polymer blends of polyphenylene oxide (PPO) and Polystyrene (PS). The Polymer blends of Poly (Phenylene Oxide) (PPO) and Poly (Styrene) (PS) has been prepared using solution casting technique. The pure polymeric samples and their blends PS:PPO in the ratio 95:05; 90:10; 85:15; and 80:20 of their weight percentage has been prepared. The prepared polymer blends were characterized by using X-ray diffraction (**XRD**) techniques for their structural characteristics, Fourier Transform Infrared Spectroscopy (**FTIR**), and Scanning Electron Microscopy (**SEM**) were undertaken for their surface morphological studies. It is found that, the interplanar distance, crystallite size and the order of crystallinity is maximum for 10 wt. % of PPO. The morphology of blends shows that PPO and PS are miscible with each other.

INTRODUCTION

Polymers can go through impressive structural and morphological changes in the confinement area, due to their very unstable nature. This may be produced by relatively weak variation of external condition, such as application of external fields, changes in temperature, moisture, mechanical stress etc. consequently surface rearrangement of the polymer chains as a result of environmental or interfacial interactions are often irregular. The search of innovative polymer materials motivates workers to polymerized new monomer, or from accessible monomer new random block or graft copolymer can be developed. A third substitute has been to blend existing polymers to fabricate material with new properties. This usually requires little or no capital expenditure relative to production of new polymer, which is a noticeable advantage of this approach. One of the key factors determining the performance of such new materials is miscibility between the polymers. This holds for ultra-thin film materials as well. Very few polymers are identified to be well-matched with each other in nature. Poly (2,6-dimethyl-l,4-phenylenoxide) (PPO) and Polystyrene (PS) form a pair of such polymers found to be compatible in melts[1,2]. Poly (2,6-dimethyl-l, 4-phenylene oxide) (PPO) is an attractive material for film preparation. It possesses outstanding mechanical properties and is resistant to a number of reagents. PPO is known as a good engineering polymer with superior mechanical properties and good miscibility with PS [1,2]. As polymer blends become more popular in research and in application, it is very important to know their structural and mechanical properties.

EXPERIMENTAL

The films of PS blended with PPO in various compositions of (100/0) (95/5), (90/10), (85/15), (80/20), (0/100) by weight percent were prepared using the solution– cast technique on an optically plane glass substrates inside an oven at 50°C using acetone and benzene (LR grade) as the common solvent. The sample so prepared was dried in air for 24

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A Study of The Optical Band Gap Energy and Urbach Energy of Fullerene (C_{60}) Doped PMMA Nanocomposites

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Abstract. Fullerene dispersion in a polymer matrix alters the values of band gap energy and Urbach energy of the nanocomposite. In the presented work, the influence of fullerene dispersion and polymer-fullerene interactions on the band gap energy and Urbach energy of poly (methyl methacrylate)-fullerene C_{60} nanocomposite has been studied by means of UV-Vis absorption spectroscopy. Pure and different doped films of gradually increasing concentrations were fabricated using solvent casting technique. Optical properties of these films were obtained from the UV-VIS absorption spectra, at normal incidence, over190-1100 nm spectral range. The optical absorption edge was described using the Tauc model. Band gap energy of the thin films was found using Tauc plot. The width of the band tails, known as Urbach tails, were evaluated to quantify the structural disorder. Optical characterization showed that average absorption and band gap energy decreased, while Urbach energy increased with the addition of fullerene C_{60}.

Keywords: fullerene, nanocomposites, optical band gap, Urbach energy

INTRODUCTION

Polymer nanocomposites are materials that have polymer as matrix material and nanoadditives are used as reinforcement material. A typical polymer composite is a combination of polymer (matrix) and a filler (reinforcement)[1]. Polymers are usually flexible, lightweight, and are considered to be an excellent host material for both organic and inorganic nanoparticles. The polymer acts as a host with the nanoparticles when they are embedded into them. However, the properties of polymer composites depend on type of incorporated nanoparticles, as well as their size and shape, concentration and interaction with the polymer matrix [2].

Over recent decades, polymer-fullerene nanocomposites have accumulated considerable academic and industrial interest in the development of advanced materials for a wide range of applications. Fullerenes also known as Buckminster fullerenes, when introduced into the host matrix, even in small concentrations, results into a nanocomposite with changed mechanical, optical and electronic properties [3]. Fullerene (C_{60}) –containing polymers, have been designed to amalgam the interesting electronic and optical properties of C_{60} with the attractive mechanical properties and processing advantages of the polymers [4]. Among various polymers, poly(methyl methacrylate) (PMMA), a commercially available polymer, is a highly transparent plastic with good mechanical strength and is used widely for optical and medical applications[5-6].

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Poly (Vinyl Alcohol) Supported Flexible films of Graphene Oxide and Reduced Graphene Oxide and Their Structural Study

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Abstract. Graphite oxide or graphene has emerged as a promising material for researchers and technological world, because of its amazing mechanical property along with its super electrical property. Therefore, this material has being used in numerous potential utility viz, polymer channels, sensors, energy transformation, and vitality stockpiling gadgets. The synthesis and analysis of PVA Poly(vinyl alcohol) supported GO (graphene-oxide) thin films were described in the performed work. Graphene-oxide was obtained via a facile method which based on the modified Hummers reaction scheme. The morphology and physical properties of graphene oxide were analyzed via Fourier transforms infrared (FTIR), images of SEM and Raman spectroscopy. The spectral outcomes of FTIR analysis showed that the graphite flakes were oxidized, the outcome of this process various functional groups generated which are attached on diametrical ends of structure and basal plane such as C-O-C, C-O, COOH, and C-H, respectively on the surfaces of the graphene-oxide. From the study of Raman spectroscopy, the intensity ratio of G band and 2D band reveals that the obtained materials are monolayer. With the help of SEM analysis morphology of the material could be analyses.

Keywords: PVA; Graphene-oxide; reduced-graphene oxide; polymer nanocomposites; FTIR; Raman

INTRODUCTION

Graphite, which is one of the allotropes of carbon, has great potential to be transformed into graphene- oxide. Graphene-oxide, which is a novel transformation of graphite, is a 2D (two dimensional) precious substance. It offers remarkable mechanical [1,2]and thermal [3] properties. Moreover it shows excellent electrical properties [4] so that these properties establish the prevalence of graphene over traditional materials [5]. Graphene-oxide thin films can easily be prepared by solvent-casting methods [6] which find numerous applications in electronics, biosensors, charge storage applications, and fabrication of functional nano-composites [7]. When graphene oxide is formed from graphite, several oxygen containing functional groups are added to graphite, which means that graphene oxide carries many oxygen functional groups in its basal planes and along its diametrical ends. These sheets can easily be used for chemical functionalization and homogeneous dispersion in polymer matrices, and its subsequent de-oxygenationyields new composites materials [8].

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Absorption and Crystalline Studies on Reduced Graphene Oxide:Poly(Vinyl Alcohol) Polymer Nano composites Films

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Abstract. Present study deals with the synthesis of reduced Graphene Oxide (rGO) and their nanocomposite films using PVA Polymer. The developed samples have been studied for their absorption and crystalline properties with the help of Uv-Vis Spectroscopy and X-Ray Diffraction techniques. The crystalline study reveals that, as we increase the concentration of rGO into the PVA matrix, the crystalline properties are also enhancing towards stable structure. The absorption study reveals that, as we are increasing the concentration of rGO into the PVA matrix the optical band gap decreases. On the basis of both studies, we can say developed polymer nanocomposite films are more stable beyond 4ml concentration of rGO solution.

INTRODUCTION

Nanoscience and nanotechnology is a branch of science which deals with the synthesis and characterization of nanomaterials. Carbon is one of the most ordinary atoms on Earth. Graphene, graphene oxide, and their derivatives are presently the subject of a immense deal of research, both in terms of their fundamental physical, chemical, structural properties, as well as the exciting promise of their practical applications in diverse fields. Graphene [1], a "speculate material" is the world's strongest material; also it is an excellent thermal and electrical conductor. It has fascinated scientists and engineers because of having extraordinary properties and applications [2,3]. In the present study the synthesis of reduced Graphene Oxide has been carried out using modified Hummer Method. The synthesized solution of reduced Graphene Oxide has been incorporated into the PVA Polymer matrix to prepare polymer nanocomposite films. The effect of incorporation of rGO has been studied for their crystalline and absorption properties[4-6].

EXPERIMENTAL DETAILS

Material Used in Present Study

Natural graphite was obtained from Research-Lab Fine Chem. Industries. Procurements of source materials like PVA, Phosphoric Acid (85%), concentrated Sulfuric Acid (98%), Hydrogen Peroxide (30%) and Potassium Permanganate (99.9%), and Hydrochloric Acid (37%) were done from Merck and Sigma-Aldrich. The N,N-methylene bisacrylamidewere used as a cross-linker and potassium persulphate (KPS) used as an initiator. Acrylonitrile (AN) was obtained from Hi-Media Lab Pvt. Ltd and purified before polymerization.

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Development of Marker in the Soft Gold Mushroom *Cordyceps* spp. for Strain Improvement

Loknath Deshmukh, Diva Gupta & Sardul Singh Sandhu

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Abstract

Natural drugs play extensive role and are the basis of traditional systems for cure and treatment of diseases. Entomopathogenic fungi *Cordyceps* Spp. are one of the unique and valuable sources of bioactive compounds which help in treatment of various diseases like nervous disorders, cardiovascular diseases, tumors, ageing, hypo-sexuality, etc. A significant decrease in natural production of *Cordyceps* Spp. has been observed in the last few decades from protected biosphere reserves, due to thorough and illegal harvesting. This compels the necessity of artificial cultivation and strain improvement strategies. For identifying

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Original article

Urinary tract anti-infectious potential of DFT-experimental composite analyzed ruthenium nitrosyl complex of N-dehydroacetic acid-thiosemicarbazide

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UTI

ABSTRACT

Urinary tract infections (UTIs) are counted among serious health problems affecting large number of people each year. UTIs are the second most common infections. This paper reports the synthesis of a novel nitrosyl complex of Ru(II) that has been found effective against some selected gram negative bacteria, *E. coli* and *Pseudomonas*. It has been found that the activity was pronounced more against *Pseudomonas* than *E. coli*. Hence, the complex may be seen effective agent against UTI. On characterizing the complex by virtue of combined experimental-DFT scope, a suitable octahedral structure has been suggested. Molecular specification under B3LYP functional, Lanl2DZ basis set for Ru atom and 6–31g(d,p) for all other atoms were employed. Electron density plots and geometrical optimization were the main theoretical insights. Elemental analysis, mass spectrometry, NMR, FT-IR, UV-vis, cyclic voltammetry and TGA were the characterization techniques made comparable to computed data. From overall study it may be culminated that both the experimental and theoretical outcomes have been found in good agreement with each other.

1. Introduction

Nitrosyl complexes are special class of metallic compounds having multifarious applications (Maurya and Mir, 2014; Yonemura et al., 2006; Yonemura, 2009). Depiction of NO-release (Franco et al., 2014) and their stability are among most recent interesting insights being explored (Truzzi and Franco, 2014). In some cases centering reduction on the nitrosyl ligand (Truzzi and Franco, 2014) or increase in number of metallic centres is helpful in this context (Carneiro et al., 2014). The retrograde messenger role of NO (Santos et al., 2014), cell penetrating ability and cytotoxicity has fascinated the related workers (Tfouni et al., 2013). Some concerns regarding the NO release with anti HIV and anti cancer activities have also been investigated.

Synthetic chemistry of ruthenium nitrosyl complexes have gained (Il'in et al., 2014; Truzzi and Franco, 2014) much attention because of the admirable facts of metal reactivity. In some cases of nitrosyl-bridged diruthenium complexes protonation of metal-metal bonds by the addition reaction of proton has been brought to light (Mayer and Böttcher, 2014) and the enhanced metal basicity and spontaneous reaction with a proton (from HBF_4) in diethyl ether to afford the corresponding oxidative addition has been recorded. Some crystalline forms of the nitrosyl ruthenium complex have been worked out (Correa et al., 2013) showing volume of guest solvents, the unit cell parameters and the resulting *iso*-structural arrangement with small difference in the intermolecular interactions, with caged guest solvents, that interact with the complex by hydrogen bonds.

Pyrone derivatives like dehydroacetic acid form a large number of anti-fungal and anti-microbial agents (Cindric et al., 2004; Jednacak et al., 2011; Somogyi and Sohar, 1995). Thiosemicarbazones are referred to behave as an important class of biologically active ligands (Pradhan and Ramana Rao, 1977) reflecting pharmacological, antitubercular and antiviral properties (Mohan et al., 1985; Ferrari et al., 2001).

Various functionals and basis sets applied on nitrosyl complexes (Kathrin et al., 2013) help to sum up the chemical nature of NO (Caramori et al., 2013; Wu et al., 2013). The calculations

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An old oxovanadium(IV) complex of N-(salicylidene)sulfanilamide: theoretical validity of experimental observations

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ABSTRACT

Sulfa drug Schiff base complexes of oxovanadium are counted among highly significant molecular scaffolds of industrial and medicinal relevance. In order to present a theoretical validation of our earlier reported complex of this sort herein, a comparative experimental theoretical investigation of N-(salicylidene)sulfanilamide Schiff base and its oxovanadium(IV) complex, $[VO(sal\text{-}snm)_2(H_2O)]$ based on density functional theory calculations using the B3LYP as functional and 6-31++G(d,p) (for ligand)/LANL2DZ (for Vanadium) basis set is being reported. The calculated vibrational frequencies have been compared with experimental FT-IR spectra of the selected compounds. The Molecular geometry optimizations, frontier orbital analysis, hyperpolarizability calculations and molecular electrostatic surface potential (MESP) topologies of the title compounds have been sought in this work. From the molecular geometrical optimization of the oxovanadium(IV) complex a suitable octahedral structure has been confirmed. The calculated HOMO and LUMO energies show that charge transfer occurs within the molecules. The Non-linear optical properties encompassing the applicability of electric dipole moment (μ), polarizability (α), mean polarizability ($\Delta\alpha$) and hyperpolarizability (β_0) values have been evaluated through quantum chemical calculations.

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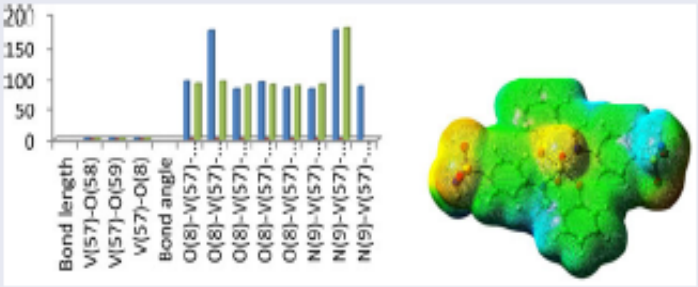
KEYWORDS
Sulfa drug; Oxovanadium(IV) complex; $[VO(sal\text{-}snm)_2(H_2O)]$; DFT calculations; HOMO-LUMO; NBO analysis; NLO; MESP

GRAPHICAL ABSTRACT



1. Introduction

Sulfa drug Schiff bases have been shown to possess well pronounced biological implications and has led to considerable interest in their coordination chemistry. Their broad spectrum biological activity has attracted researchers to investigate the respective sensitivity in various fields of medicine (Maurya et al. 2015). Nagpal and Singh[1] have reported Sulfonamides as the first drugs found to have potentiality to act against various diseases. Due to fascinating properties of Sulphur containing organic chelates Sharaby[2] suggested these ligands among efficient coordination compounds. The Schiff base complexes of this form have been found to have catalytic significance in terms of both in vivo and in vitro experiments.[3–5] The evidences of fascinating properties of such metal complexes containing nitrogen and oxygen donors[6–9] have driven attention of researchers to carry out hyphenated experimental-density functional theory (DFT) study of vamadium(IV) complexes of this form. This may be attributed due to coordination chemistry[6,7] of vanadium has acquired renewed interest since the discovery of vanadium in organisms such as certain ascidians and Amanita muscaria mushrooms and as a constituent of the cofactors in vanadate-dependent haloperoxidases and vanadium nitrogenase. Vanadium is a transition metal that, being ubiquitously distributed in soil, crude oil, water and air, also found roles in biological systems and is an essential element in most living beings. There are also several groups of organisms which accumulate vanadium, employing it in their

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Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/lsrt.
Supplemental data for this article is available online at publisher's website.

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Environmentally sound system for E-waste: Biotechnological perspectives

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Studies on CdSe/PVK nanocomposites films for electroluminescent display applications

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Characterization of Pure and Doped Polysulfone by X-Ray Diffraction and UV- Visible Spectroscopic Techniques

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Abstract. Polymers are regarded as good dielectrics which are capable of storing the charge in them permanently, when subjected to a field – temperature treatment. The electret state and carrier mobility of polymers can be greatly affected by impregnating the polymer with suitable dopants. The process of doping of organic compound of low molecular weight improves the electrical conductivity of polymer due to formation of charge transfer interaction between acceptor and donor molecule. Spectroscopic techniques are used to illustrate the structural modification in pure polymer with increasing ratio of impurity. In the present investigation, Polysulfone is used as host polymer and malachite Green is used as dopant. The sample of pure and malachite green doped Polysulfone in the form of foil were prepared by isothermal immersion technique. For the preparation of pure sample 4 gm of Polysulfone was dissolved in 50 ml of Dimethyl farmamide (DMF) solvent, while for the preparation of doped sample 10,25 , 50 and 100 mg Malachite Green was mixed with 4 gm of Polysulfone respectively. For the study of structural and optical characterization of these pure and doped samples, X-Ray Diffraction Spectroscopy (XRD) and UV- Visible spectroscopy techniques were used. The XRD diffractograms of pure and doped polysulfone shows both sharp as well as diffused peaks respectively correspond to the crystalline regions and amorphous regions of polymer. While considering the variation of intensity with two theta angle , it is observed that for pure sample maximum intensity is observed at 18.28^0, whereas for doped samples maximum intensity is observed at 18.51^0, 18.86^0, 20.36^0, 20.81^0 respectively due to the increase in doping ratio. This observation confirms the enhancement in amorphous nature of polysulfone. The UV-Visible spectroscopic study shows that the transmittance decreases as the ratio of doping is increased in pure polysulfone. The reduction in intensity of transmittance of pure sample is clearly apparent in the present case and some new peaks are also observed. This action indicates the development of Charge Transfer Complexes (CTC) between the donor and acceptor molecule, and hence signifies the improvement in electrical properties of Polysulfone polymer.

INTRODUCTION

As the whole world is advancing at a faster pace in this twenty first century, one can observe a rapid development in the field of Polymer Science. From the era of stones and metals, we have come to the age of nuclear energy, nanotechnology and polymers.Undeniably; we are living in the world of polymers. The imagination of human life without the polymers is impossible, as nearly all products that we use contain polymers in some form. Hence by considering rapid increasing rate of polymer in various field, Scientists, technologists and engineers have declared this era as the 'Polymeric age'.[1-2].A polymer is made up of many small molecules which combine to form a single long or large molecule .The individual small molecules from which a polymer is formed are known as monomer molecule and are linked to form a big polymer molecule the process being known as 'Polymerization'[3].Polymers are ideal material for many industrial applications and research because they have

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METHODOLOGIES AND APPLICATION

River flow prediction using hybrid PSOGSA algorithm based on feed-forward neural network

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Abstract
River flow modeling plays an important role in water resources management. This research aims at developing a hybrid model that integrates the feed-forward neural network (FNN) with a hybrid algorithm of the particle swarm optimization and gravitational search algorithms (PSOGSA) to predict river flow. Fundamentally, as the precision of a FNN model is essentially dependent upon the assurance of its model parameters, this review utilizes the PSOGSA for ideal preparing of the FNN model and gives the likelihood of boosting the execution of FNN. For this purpose, monthly river flow time series from 1990 to 2016 for Garber station of the Turkey River located at Clayton County, Iowa, were used. The proposed FNN-PSOGSA was applied in monthly river flow data. The results indicate that the FNN-PSOGSA model improves the forecasting accuracy and is a feasible method in predicting the river flow.

Keywords Feed-forward neural networks · Gravitational search algorithm · Hybrid model · Particle swarm optimization · River flow forecasting · Turkey River

1 Introduction

Stream flow forecasting is a critical undertaking for hydrologists for planning and management of water assets ventures. Keeping in mind the end goal to determine stream flow decisively, scientists and researchers have concentrated consideration on the use of artificial intelligent methods for stream flow modeling in the current years. The artificial intelligent (AI) approaches do not have a total comprehension of the procedure of the stream flow generation. They are reasonable for "information-rich" but "theory-weak" frameworks.

Several applications of these intelligent models for stream flow forecasting have been addressed in the literature (e.g., Achela and Fernando 1998; Nayak et al. 2004; Jain and Kumar 2007; Wang et al. 2009; Kisi and Cimen 2011; Ch et al. 2013; Kalteh 2013; Awchi 2014; Kashani et al. 2015; Ghorbani et al. 2016a, b; Delafrouz et al. 2017)

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Photoluminescence Studies of Rare Earth Doped Apatite Structured Phosphors

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Abstract

We developed novel phosphors based on $Y_6Ba_4(SiO_4)_6F_2$(YBSF) apatite doped with Dy^{3+}. Phosphors with different doping concentrations of Dy^{3+} were prepared and their morphological, structural and spectral properties were analyzed. XRD pattern confirms the formation of $Y_6Ba_4(SiO_4)_6F_2$ apatite structured phosphors with space group $P6_3/m$ and Debye scherrer formula gives the average crystalline size 33.4 nm. The morphological and topographical studies were done by FESEM and HRTEM analysis. EDX spectra show presence of all initial reactants in the final product. Photoluminescence spectra show two prominent peaks at 487 nm and 573 nm corresponding to

Study of dielectric relaxation and persistence of polarization in Polysulfone foils sensitized with Malachite Green using Transient discharging current

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Abstract. The transient current in the discharging mode in Polysulfone (PSF) and Malachite green (MG) doped PSF foils measured as a function of different pooling field (kV/cm) at different pooling temperature have been found to follow the Curie –Von Schweidler law, characterized by different slopes in the short and long time regions. All measurement were performed on isothermal immersion technique using foils of thickness approximately 35-45μm.Various mechanisms which may be responsible for the time-dependent transient currents of pure and malachite green doped PSF foils are discussed. The effect of doping on the discharge current indicated the formation of molecular aggregates.

Key words: Polysulfone, malachite green, molecular aggregates, transient discharging current, CTC formation.

INTRODUCTION

During recent years, researches have shown considerable interest in the electret state of amorphous polymers. The mechanism and character of conduction in polymers has been the subject of many investigations. A systematic analysis of transient current has indicated how a combination of time, temperature and field dependence can lead to a fairly unambiguous conclusion as to injection mechanism and the amount of trapping taking place. A number of mechanisms have been proposed to explain the transient currents, the most important of which are dipole polarization [1], hopping of charge carriers from one localized state to another [3], interfacial bulk polarization [1] (crystalline- amorphous boundaries etc.), electrode polarization [3] (hetero- space charge) and injected homo- space charge [4]. Polysulfone is a class of amorphous polymer with excellent thermal, mechanical, chemical and hydrolyte stability and hence combination of Polysulfone and Malachite Green is important for studying of dielectric relaxation and persistence of polarization in these samples [5-9]. Malachite green is a cationic dye obtained by the introduction of NH_2, NR_2, or OH groups into the rings [10]. The mechanism of the time –dependent polarization effect may be studied from an analysis of transient current in discharge mode with respect to polarizing fields at constant temperature and electrode materials.

EXPERIMENTAL

The Polysulfone and Malachite green used for the present study were supplied by Glexo Leb. Bombay. The samples for the present investigation were prepared by the isothermal immersion technique. The solution of particular concentration was prepared by dissolving the PSF and MG in different weight ratios in common solvent DMF. Samples of wt% compositions PSF pure 4gm, PSF: MG:: 4gm:3mg; 4gm:5mg and 4gm:7mg designated as A2, A2B1, A2B2 and A2B3 respectively, were prepared. For Transient discharging current measurements samples were polarized with fields of E_P = 60, 90, 120 and 150 $kVcm^{-1}$ at temperatures T_P = 45, 55, 65 and 75°C for 50 min. during which the transient current in the discharging mode was observed 2 min after the removal of the field. The current released is recorded using a Keithley (610 C) electrometer while the temperature is increased at a constant rate 3°$Cmin^{-1}$.

RESULTS AND DISCUSSION

Typical plots of discharging current at various temperature for samples polarized with 120kV/cm fields are shown in figs 1, 2 and 3 and current at various fields for samples polarized with 75°C are shown in figs 4 and 5 and

Soft Computing
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METHODOLOGIES AND APPLICATION

An efficient ID-based cryptographic transformation model for extended chaotic-map-based cryptosystem

Chandrashekhar Meshram[1,2] · Cheng-Chi Lee[3,4] · Sarita Gajbhiye Meshram[1] · Chun-Ta Li[5]

Abstract
Recently, the chaos theory has been dealt with as a decent approach to reducing the computational complexity of a cryptographic technique while fulfilling the security necessities. In an ID-based cryptographic system where public keys are distributed to individual users, the application of chaotic maps allows users to set their network addresses or names as their individual public keys. This makes the public key cryptographic technique very user-friendly in that the public key confirmation process can be very informal and direct. In such a design, no huge public key database is required, and therefore, those security issues arising as a result of the existence of a public key database can be avoided. The aim of this article is to go deep into the possibility of transforming a chaotic-map-based cryptosystem into an ID-based technique without having to build a new framework from scratch or to do adjustment to the chaotic maps.

Keywords Chaotic maps · Public key cryptography · ID-based cryptography · IND-CCA · IND-sID-CCA · Random oracle model

1 Introduction

The research into the world of chaotic maps as well as their applications in the field of cryptography has gained extensive attention in recent years, taking up a mainstream course in the realm of cryptosystems. Chaotic frameworks are mostly characterized by delicate reliance on beginning conditions and closeness to arbitrary behavior, properties which appear to be essentially similar to some required by a few cryptographic primitives (Kocarev 2001; Wei et al. 2017).

In 1976, Diffie and Hellman proposed one of the world's first public key cryptographic systems in their well-known paper "*New Directions in Cryptography*" (Diffie and Hellman 1976). Shortly after, Rivest, Shamir and Adlemann proposed the notable RSA cryptosystem (Rivest et al. 1978) and confirmed the practicality of public key cryptosystems. Since then, numerous new cryptosystems have been developed and publicly presented (see Menezes et al. 1997; Stinson 2002 for some related examples). In general, public key cryptography has been recognized as a well-established domain of research and study in the field of information transmission/communication security.

In 1993, in his doctoral dissertation, Hwu (1993) introduced the chaos theory to public key cryptography and presented his chaotic public key cryptosystem design with a one-dimensional difference equation (1DDE) as well as a quadratic difference equation. In addition, Hwu's framework makes use of ElGamal's technique (ElGmal 1995) to

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PLOS ONE

RESEARCH ARTICLE

Plasmodium falciparum glutamate dehydrogenase is genetically conserved across eight malaria endemic states of India: Exploring new avenues of malaria elimination

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Abstract

Accurate and timely diagnosis is very critical for management, control and elimination of the malaria. Malaria rapid diagnostic tests (RDTs) have improved the diagnosis and management of malaria in remote areas, community and places where microscopy is not available for diagnosis. According to WHO report 2018, *Plasmodium falciparum* malaria constitutes more than 50% of malaria cases in India. Most of the RDTs used for diagnosis of falciparum malaria today employ HRP2 as a target antigen. However, low density parasitemia and deletion of hrp-2 gene in *P. falciparum* leads to false negative results and necessitates the

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New Approach for Sediment Yield Forecasting with a Two-Phase Feedforward Neuron Network-Particle Swarm Optimization Model Integrated with the Gravitational Search Algorithm

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The *in vitro* and *in vivo* anti-hepatotoxic, anti-hepatitis B virus and hepatic CYP450 modulating potential of *Cyperus rotundus*

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Free PMC article

Abstract

In the present study we investigated the hepatotoprotective, hepatitis B virus (HBV) inhibitory and hepatic CYP450 enzyme (CYP3A4) modulatory potential of *Cyperus rotundus* rhizome fractions. The crude ethanol-extract, including different organic and aqueous fractions were tested for *in vitro* cytoprotection on HepG2 cells (MTT assay), followed by *in vivo* evaluation in Wistar rats (serum

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Fracto-mechanoluminescence in Mn/Cu doped ZnS induced by steel ball and cylindrical piston

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METHODOLOGIES AND APPLICATION

Comparison of AHP and fuzzy AHP models for prioritization of watersheds

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Abstract
Prioritization of watersheds for conservation measures is essential for a variety of functions, such as flood control projects for which determining areas of top priority is a managerial decision that should be based on physical, social, and economic characteristic of the region of interest and the outcome of past operations. The objective of this study therefore was to investigate morphological characteristics and identify critical sub-watersheds which are liable to be damaged, using remote sensing/geographical information systems and multi-criteria decision-making methods AHP/FAHP. Fourteen morphometric parameters were selected to prioritize sub-watersheds using an analytical hierarchical process (AHP) and a fuzzy analytical hierarchical process (FAHP). Based on the FAHP approach, sub-watersheds, as vulnerable zones, were categorized in five priority levels (very high, high, medium, low, and very low levels). The conservation and management measures are essential in the high to very high levels categories. Thus, the FAHP approach is a practical and convenient method to show potential zones in order to implement effective management strategies, especially in areas where data availability is low and soil diversity is high. Finally, without having to encounter high cost and a waste of time, sub-watersheds can be categorized using morphometric parameters for implementing conservational measures to simultaneously conserve soil and the environment.

Keywords Watershed · Prioritization · Analytical hierarchical process · Selection criteria · Fuzzy analytical hierarchical approach

1 Introduction

A watershed is a physically complex system. It consists of a number of unit source areas (having approximately uniform properties), and partial and variable source areas each exhibiting a different response (Meshram et al. 2018a, b). The juxtaposition of different source areas of contrasting topography, rock type, and land use and soil characteristics result in areal variations in watershed processes and response. Every hydrologic design is therefore different because the physical properties often vary with site (Gajbhiye and Sharma 2017).

Geomorphological parameters directly or indirectly reflect nearly the entire watershed-based causative components influencing runoff and sediment loss (Meshram et al. 2017a). In this manner, without huge hydrological data, morphometric parameters along with satellite-based land use-land cover information of watersheds might be helpful in prioritizing sub-watersheds. In particular, for ungauged or inadequately gauged watersheds, a morphometric analysis can be desirable, because it can establish relationships between different aspects of the drainage basin. It may also help with the evaluation of different drainage basins from different climatic and geologic

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METHODOLOGIES AND APPLICATION

An identity-based encryption technique using subtree for fuzzy user data sharing under cloud computing environment

Chandrashekhar Meshram[1] · Cheng-Chi Lee[2,3] · Sarita Gajbhiye Meshram[1] · Muhammad Khurram Khan[4]

Abstract
The advancement of the cloud storage technology opens up a wide range of possibilities for adaptable data sharing. When sharing data to an extensive number of users with fuzzy identities, the data proprietor must use an appropriate identity-based encryption technique that satisfies both efficiency and security prerequisites. Identity-based encryption is a promising possibility to ensure fuzzy user data sharing while meeting the security essentials; however, it may encounter efficiency trouble in multi-receiver settings. Recently, identity-based encryption has received much attention, and most of the research has aimed to apply the technique in real-world systems. A major concern about using identity-based encryption is the safety of the private keys, as disclosure of secret keys requires the reissuing of encryptions already doled out. The capability to minimize the risks associated with key disclosure is particularly important due to the increased use of mobile and unprotected devices. In this article, we shall propose a forward-secure identity-based encryption technique based on subtree for fuzzy user data sharing under cloud computing environment, and we shall demonstrate that the technique is semantically secure against a chosen subtree and chosen ciphertext attack (IND-CST–CCA). In addition, we will show the superiority of our new technique over the currently existing methods in terms of security and the length of public key. Then, we will also discuss the potential of our new technique to be deployed in pay TV systems and grid security.

Keywords Identity-based encryption · Cloud storage · Subtree · Bilinear pairings · Random oracle · Pay TV system · Grid security

1 Introduction

Cloud storage has brought new ways of storing, retrieving, and sharing digital data, turning the idea of on-request data sharing into reality. These days, there have been large-scale mergers among smaller cloud storage service providers into cloud specialist co-ops or cloud data centers that offer data sharing service at nominal cost. With the help of cloud storage, an agent in a business can readily obtain valuable data or share the latest information with the headquarters, associates, or subordinates in an on-request way anytime anywhere. This fundamentally enhances the efficiency in data exchange and processing and brings down communication costs.

However, easy and swift accessibility is oftentimes a synonym of security vulnerability when it goes to the

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Environmentally sound system for E-waste: Biotechnological perspectives

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ABSTRACT

The rapid e-waste volume is generating globally. At the same time, different recycling technologies, mainly the mechanical and chemical methods well studied, while the biological method is the most promising approach. Therefore, this article provides a comprehensive information about extracting valuable metals from e-waste. In addition, this

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Studies on CdSe/PVK nanocomposites films for electroluminescent display applications

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Characterization of Pure and Doped Polysulfone by X-Ray Diffraction and UV- Visible Spectroscopic Techniques

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Abstract. Polymers are regarded as good dielectrics which are capable of storing the charge in them permanently, when subjected to a field – temperature treatment. The electret state and carrier mobility of polymers can be greatly affected by impregnating the polymer with suitable dopants. The process of doping of organic compound of low molecular weight improves the electrical conductivity of polymer due to formation of charge transfer interaction between acceptor and donor molecule. Spectroscopic techniques are used to illustrate the structural modification in pure polymer with increasing ratio of impurity. In the present investigation, Polysulfone is used as host polymer and malachite Green is used as dopant. The sample of pure and malachite green doped Polysulfone in the form of foil were prepared by isothermal immersion technique. For the preparation of pure sample 4 gm of Polysulfone was dissolved in 50 ml of Dimethyl farmamide (DMF) solvent, while for the preparation of doped sample 10,25 , 50 and 100 mg Malachite Green was mixed with 4 gm of Polysulfone respectively. For the study of structural and optical characterization of these pure and doped samples, X-Ray Diffraction Spectroscopy (XRD) and UV- Visible spectroscopy techniques were used. The XRD diffractograms of pure and doped polysulfone shows both sharp as well as diffused peaks respectively correspond to the crystalline regions and amorphous regions of polymer. While considering the variation of intensity with two theta angle , it is observed that for pure sample maximum intensity is observed at 18.28^0, whereas for doped samples maximum intensity is observed at 18.51^0, 18.86^0, 20.36^0, 20.81^0 respectively due to the increase in doping ratio. This observation confirms the enhancement in amorphous nature of polysulfone. The UV-Visible spectroscopic study shows that the transmittance decreases as the ratio of doping is increased in pure polysulfone. The reduction in intensity of transmittance of pure sample is clearly apparent in the present case and some new peaks are also observed. This action indicates the development of Charge Transfer Complexes (CTC) between the donor and acceptor molecule, and hence signifies the improvement in electrical properties of Polysulfone polymer.

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METHODOLOGIES AND APPLICATION

River flow prediction using hybrid PSOGSA algorithm based on feed-forward neural network

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Abstract
River flow modeling plays an important role in water resources management. This research aims at developing a hybrid model that integrates the feed-forward neural network (FNN) with a hybrid algorithm of the particle swarm optimization and gravitational search algorithms (PSOGSA) to predict river flow. Fundamentally, as the precision of a FNN model is essentially dependent upon the assurance of its model parameters, this review utilizes the PSOGSA for ideal preparing of the FNN model and gives the likelihood of boosting the execution of FNN. For this purpose, monthly river flow time series from 1990 to 2016 for Garber station of the Turkey River located at Clayton County, Iowa, were used. The proposed FNN-PSOGSA was applied in monthly river flow data. The results indicate that the FNN-PSOGSA model improves the forecasting accuracy and is a feasible method in predicting the river flow.

Keywords Feed-forward neural networks · Gravitational search algorithm · Hybrid model · Particle swarm optimization · River flow forecasting · Turkey River

1 Introduction

Stream flow forecasting is a critical undertaking for hydrologists for planning and management of water assets ventures. Keeping in mind the end goal to determine stream flow decisively, scientists and researchers have concentrated consideration on the use of artificial intelligent methods for stream flow modeling in the current years. The artificial intelligent (AI) approaches do not have a total comprehension of the procedure of the stream flow generation. They are reasonable for "information-rich" but "theory-weak" frameworks.

Several applications of these intelligent models for stream flow forecasting have been addressed in the literature (e.g., Achela and Fernando 1998; Nayak et al. 2004; Jain and Kumar 2007; Wang et al. 2009; Kisi and Cimen 2011; Ch et al. 2013; Kalteh 2013; Awchi 2014; Kashani et al. 2015; Ghorbani et al. 2016a, b; Delafrouz et al. 2017).

Artificial neural networks (ANNs) are widely used models for classification and prediction of time series that have been used in several different applications (Husken and Stagge 2003; Brown et al. 2008; Alweshah 2014; Adhikari 2015; Gairaa et al. 2016; Kisi et al. 2017). Kang et al. (2016) implemented a PSO-SVM and ABC-SVM methods in order

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Photoluminescence Studies of Rare Earth Doped Apatite Structured Phosphors

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Abstract

We developed novel phosphors based on $Y_6Ba_4(SiO_4)_6F_2$(YBSF) apatite doped with Dy^{3+}. Phosphors with different doping concentrations of Dy^{3+} were prepared and their morphological, structural and spectral properties were analyzed. XRD pattern confirms the formation of $Y_6Ba_4(SiO_4)_6F_2$ apatite structured phosphors with space group $P6_3/m$ and Debye scherrer formula gives the average crystalline size 33.4 nm. The morphological and topographical studies were done by FESEM and HRTEM analysis. EDX spectra show presence of all initial reactants in the final product. Photoluminescence spectra show two prominent peaks at 487 nm and 573 nm corresponding to

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Research Article

SCREENING OF GLUCOAMYLASE PRODUCING FUNGI FROM THE SOILS OF JABALPUR REGION

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Amylolytic, Soil fungi, Amylase activity index, Zone of clearance, Glucoamylase activity

ABSTRACT

The amylolytic soil fungi show potential applications in bakery, alcohol, textile and detergent industries. The present work was designed with aim of isolation of glucoamylase producing fungi from soil near different bakery shops, atta-chakki shops and flour-mill dumped areas of Jabalpur region. Thereafter screening of potent fungal isolates was performed using starch hydrolysis test and solid state fermentation. It was found that out of total 62 fungal isolates obtained from different collection sites. The primary screening of all fungal isolates was done by starch hydrolysis test. Among all the fungal isolates, SSP#1, SSP#12, SSP#13, SSP#14, SSP#16, SSP#17, SSP#22, SSP#26, SSP#38, SSP#42, SSP#47, SSP#49 and SSP#58 were found to show maximum zone of clearance in starch agar media. The maximum zone diameter 27.53 mm was given by SSP#16 with amylase activity index 1.83 and maximum glucoamylase activity 2.68 ±0.52 U/mL/min. The potent fungal isolate SSP#16 was identified as *Aspergillus flavipes* strain. The study shows potential of the local potent fungal isolate for glucoamylase production in industrial sectors for achieving economy.

INTRODUCTION

The soil acts as novel source of glucoamylase producing fungi. The soil inhabits various species of fungus which degrade a wide variety of biological materials. The fungal species are mostly confined near the soil surfaces where aerobic conditions prevail (Samraj and Stella 2013). In recent years, several studies are done for the isolation and screening of fungi for enzyme production. The filamentous fungi are used for the production of useful enzymes and biological active secondary metabolites. These fungi had been found to be good source of polysachharide degrading enzymes and exploited for the production of amylolytic (amylase) enzymes.

The vast microbial flora in soil is the major component of earth's ecosystem. The fungi play major and complex role of decomposition in soil is enormously complex. The activities of decomposition can be measured by the secreted amount of enzyme by fungi.

The soil fungi help in degradation of dead matter, releasing vital nutrients thereby plays vital role in proper functioning of the ecosystem. This is done with the utilization of both simple and complex molecules as foods by the secretion of a variety of extracellular enzymes including protease, cellulase, amylase, β-glucosidase and chitinase. Fungi are mostly employed to produce industrially important glucoamylase (Imran *et al*, 2012). Many fungal species are capable of producing glucoamylase under different fermentation conditions and techniques (Norouzian *et al*, 2006). Glucoamylase occur almost exclusively in fungi and the industrial focus has been on glucoamylase from *Aspergillus niger* (Norouzian *et al*, 2006) and *Rhizopus oryzae* (Pandey *et al*, 2000). *Aspergillus awamori* (Norouzian *et al*, 2006) and *Aspergillus oryzae* (Normurodova *et al*, 2016) are also the most intensively considered for commercial production in industries. The aim of present study includes isolation of fungi from different soil samples of Jabalpur region and exploration of fungal isolates for glucoamylase production by starch hydrolysis and solid state fermentation method.

MATERIALS AND METHODS

Collection of soil samples

Soil samples were collected from sites of Jabalpur region rich in starchy waste and organic matter lying on the surface. The collection was done at a depth of 15 cm with the help of 2.5 cm

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Cancer molecular markers: A guide to cancer detection and management

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Abstract

Cancer is generally caused by the molecular alterations which lead to specific mutations. Advances in molecular biology have provided an impetus to the study of cancers with valuable prognostic and predictive significance. Over the hindsight various attempts have been undertaken by scientists worldwide, in the management of cancer; where, we have witnessed a number of molecular markers which allow the early detection of cancers and lead to a decrease in its mortality rate. Recent advances in oncology have led to the discovery of cancer markers that has allowed early detection and targeted therapy of tumors. In this context, current review provides a detail outlook on various molecular markers for diagnosis, prognosis and management of therapeutic response in cancer patients.

Introduction

Cancer is the leading cause of death in economically developed countries and the second leading cause of death in developing countries [1] due to the increased adoption of cancer-associated lifestyle choices. As the world population continues to age and developing countries continue to modernize, morbidity and mortality due to cancer are increasing. Lung, liver, colorectal, stomach and breast cancer are the most common causes of cancer deaths each year. Cancer is a complex disease occurring *via* genetic alterations or aberrations that enables transformation of normal cells into tumor cells, which results due to an interaction between the genetic factors and external agents (physical, chemical and biological carcinogens). In addition, cancers can arise *via* the aberration of different combinations of genes, which in turn may be mutated, over expressed, or deleted. During carcinogenesis, alterations in genes or mutations lead to disregard to cell cycle checkpoints which cause a normal cell to grow in an uncontrolled manner. Cancer cells thus have two heritable properties: they and their progeny (a) reproduce in defiance of the normal restraints on cell division and (b) invade and colonize territories normally reserved for other cells. Over the years diverse areas of science have shown to solve the enigma surrounding the initiation of cancer, but irrespective of the knowledge and its clinical application accumulated, a total understanding of the mechanism of cancer

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METHODOLOGIES AND APPLICATION

An efficient ID-based cryptographic transformation model for extended chaotic-map-based cryptosystem

Chandrashekhar Meshram[1,2] · Cheng-Chi Lee[3,4] · Sarita Gajbhiye Meshram[1] · Chun-Ta Li[5]

Abstract
Recently, the chaos theory has been dealt with as a decent approach to reducing the computational complexity of a cryptographic technique while fulfilling the security necessities. In an ID-based cryptographic system where public keys are distributed to individual users, the application of chaotic maps allows users to set their network addresses or names as their individual public keys. This makes the public key cryptographic technique very user-friendly in that the public key confirmation process can be very informal and direct. In such a design, no huge public key database is required, and therefore, those security issues arising as a result of the existence of a public key database can be avoided. The aim of this article is to go deep into the possibility of transforming a chaotic-map-based cryptosystem into an ID-based technique without having to build a new framework from scratch or to do adjustment to the chaotic maps.

Keywords Chaotic maps · Public key cryptography · ID-based cryptography · IND-CCA · IND-sID-CCA · Random oracle model

1 Introduction

The research into the world of chaotic maps as well as their applications in the field of cryptography has gained extensive attention in recent years, taking up a mainstream course in the realm of cryptosystems. Chaotic frameworks are mostly characterized by delicate reliance on beginning conditions and closeness to arbitrary behavior, properties which appear to be essentially similar to some required by a few cryptographic primitives (Kocarev 2001; Wei et al. 2017).

In 1976, Diffie and Hellman proposed one of the world's first public key cryptographic systems in their well-known paper "*New Directions in Cryptography*" (Diffie and Hellman 1976). Shortly after, Rivest, Shamir and Adlemann proposed the notable RSA cryptosystem (Rivest et al. 1978) and confirmed the practicality of public key cryptosystems. Since then, numerous new cryptosystems have been developed and publicly presented (see Menezes et al. 1997; Stinson 2002 for some related examples). In general, public key cryptography has been recognized as a well-established domain of research and study in the field of information transmission/communication security.

In 1993, in his doctoral dissertation, Hwu (1993) introduced the chaos theory to public key cryptography and presented his chaotic public key cryptosystem design with a one-dimensional difference equation (1DDE) as well as a quadratic difference equation. In addition, Hwu's framework makes use of ElGamal's technique (ElGmal 1995) to

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PLOS ONE

RESEARCH ARTICLE

Plasmodium falciparum glutamate dehydrogenase is genetically conserved across eight malaria endemic states of India: Exploring new avenues of malaria elimination

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Abstract

Accurate and timely diagnosis is very critical for management, control and elimination of the malaria. Malaria rapid diagnostic tests (RDTs) have improved the diagnosis and management of malaria in remote areas, community and places where microscopy is not available for diagnosis. According to WHO report 2018, *Plasmodium falciparum* malaria constitutes more than 50% of malaria cases in India. Most of the RDTs used for diagnosis of falciparum malaria today employ HRP2 as a target antigen. However, low density parasitemia and deletion of hrp-2 gene in *P. falciparum* leads to false negative results and necessitates the

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New Approach for Sediment Yield Forecasting with a Two-Phase Feedforward Neuron Network-Particle Swarm Optimization Model Integrated with the Gravitational Search Algorithm

Sarita Gajbhiye Meshram, et al. *[full author details at the end of the article]*

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Abstract

Predicting sediment yield is an important task for decision-makers in environmental monitoring and water management since the benefits of applying non-linear, artificial intelligence (AI) models for optimal prediction can be far reaching in real-life decision support systems. AI-based models are considered to be favorable predictive tools since the nonlinear nature of suspended sediment data series warrants the utilization of nonlinear predictive methods for feature extraction, and for accurate simulation of suspended sediment load. In this study, Artificial Neural Network (ANN) approaches are employed to estimate the monthly sediment load where the two-phase Feed-forward Neuron Network Particle Swarm Optimization Gravitational Search Algorithm (FNN-PSOGSA) is developed, and then evaluated in respect to 3 distinct algorithms: the Adaptive Neuro-Fuzzy Inference System (ANFIS), Feed-forward Neuron Network (FNN) and the single-phase Feed-forward Neuron Network Particle Swarm Optimization (FNN-PSO). The study is carried out using the monthly rainfall, runoff and sediment data spanning a 10 year period (2000–2009) where about 75% of data are used in model training phase, 25% in testing phase. Three statistical performance criteria namely: the mean absolute error (MAE), Nash-Sutcliffe coefficient (NSE) and the Willmott's Index (WI) and diagnostic plots visualizing the tested results are used to evaluate the performance of four AI-based models. The results reveal that the objective model (the two-phase FNN-PSOGSA model) and the single-phase FNN-PSO model yielded more precise results compared to the other forecast models. This result

Affiliations

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Original article

The *in vitro* and *in vivo* anti-hepatotoxic, anti-hepatitis B virus and hepatic CYP450 modulating potential of *Cyperus rotundus*

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ABSTRACT

In the present study we investigated the hepatotoprotective, hepatitis B virus (HBV) inhibitory and hepatic CYP450 enzyme (CYP3A4) modulatory potential of *Cyperus rotundus* rhizome fractions. The crude ethanol-extract, including different organic and aqueous fractions were tested for *in vitro* cytoprotection on HepG2 cells (MTT assay), followed by *in vivo* evaluation in Wistar rats (serum biochemistry and lipid profile). The *in vitro* anti-HBV activity was tested on HepG2.2.15 cells (HBsAg and HBeAg Elisa). Of these, the n-butanol and aqueous fractions showed the most promising, dose-dependent hepatoprotection in DCFH-injured HepG2 cells. Further, in CCl_4-injured rats, oral administration of *C. rotundus* (100 and 200 mg/kg·bw/day) significantly normalized serum markers of healthy liver function (SGOT, SGPT, GGT, ALP and bilirubin) and lipid profile (cholesterol, HDL, LDL, VLDL, TG and MDA), including tissue NP-SH and TP levels. Compared to other fractions, the ethyl acetate, n-butanol and aqueous fractions

Microbial Diversity in Ecosystem Sustainability and Biotechnological Applications pp 387–

Importance of Cyanobacterial Taxonomy in Biotechnological Applications

Suvendra Nath Bagchi & Prashant Singh

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Abstract

Cyanobacteria possess a host of proteases which unlike heterotrophs do not take part in protein nutrition. Instead, they maintain homeostasis of several vital functions, namely photosynthesis, nitrogen fixation, cellular assembly and disintegration, stress acclimation, and defense against predators. Herein, we review the Clp, FtsH, Deg/HtrA, Ctp, and SppA proteases, which under regular and photooxidative stress conditions maintain the integrity of photosynthetic and cytoplasmic membranes, periplasmic proteins, and photosystem particles,

Crystalline and Absorption Studies on Cadmium Sulphide doped Polycarbonate Composite

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Abstract. In this paper we have studied the preparation of composites of polycarbonate composite by incorporating Cadmium Sulphide(CdS) particles with different concentration. The prepared samples were characterized by the different techniques used like X-ray diffraction (XRD) techniques and UV-visspectroscopy(UV-Vis). The X-Ray diffraction technique gives the information on Crystallinity of the Sample, InterplanerDistance (d) and Crystallite Size (D). When the doping concentration is increased the crystallinity of the sample is increases and Crystallite size(D) is also increases. The UV-Vis spectroscopy technique gives information of Optical Band Gap. The energy band gap of pure polycarbonate is 4.437 eVand as we increase the concentration of cadmium sulphide the energy band gap decreases.

INTRODUCTION

Polycarbonate(PC) is an amorphous and polar thermoplastics polymer. It is used as engineering material because it has several properties such as transparency, dimensional stability, flame resistance, high heat distortion temperature and high impact strength[1]. Polycarbonate is soft in nature and the surface of polymer is easily stretched.It is used in electronic and electrical applications and has quite good insulation characteristics. Cadmium sulfide is an important II-IV group element semiconductor(at room temperature)with many excellent physical and chemical properties. This has promising application in multiple technical fields including photochemical catalysis, gas sensor, detectors for laser and infrared.

EXPERIMENTAL DETAILS

Material Used in Present Study

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A calcium-stimulated serine peptidase from a true-branching cyanobacterium, *Westiellopsis ramosa* sp. nov.

Neelam Dubey,[1] Prashant Singh,[2] and Suvendra Nath Bagchi[1]

▸ Author information ▸ Article notes ▸ Copyright and License information Disclaimer

Associated Data

▸ **Supplementary Materials**

Abstract

Go to: ▸

Unbranched heterocytous cyanobacteria produce a number of serine peptidases. We have characterized several peptidases in the cell-free extracts of a true-branched N_2-fixing cyanobacterium, *Westiellopsis ramosa* sp. nov. Upon substrate-gel zymography of intact filaments and heterocytes, five peptidase bands were resolved, whereas in vegetative cells, a single band was discernible. No band was detected in NO_3^-/NH_4^+-grown cultures suggesting that the peptidases were present under diazotrophic conditions with much of them confined to heterocytes. Using salt precipitation and chromatography, a caseinolytic peptidase, called Wrp49, was purified which also

Physiol Mol Biol Plants

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Fracto-mechanoluminescence in Mn/Cu doped ZnS induced by steel ball and cylindrical piston

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FOUNDATIONS

An efficient online/offline ID-based short signature procedure using extended chaotic maps

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Abstract
Chaos has been dealt with a decent approach to reduce computational complexity while fulfilling security necessities of a cryptographic techniques. In this article, we purpose an efficient online/offline ID-based short signature procedure based on extended chaotic maps and also demonstrated that it is protected under unforgeability of ID-based short signature under chosen message attack. Some of the intriguing arrangements of presented procedures is that it gives multi-time use of the offline stockpiling, which permits the signer to reuse the offline pre-administered information in polynomial time, rather than one-time use in all past online/offline signature procedures.

Keywords Extended chaotic maps · Signature technique · ID-based short signature procedure · UF-IBSS-CMA

1 Introduction

The investigation of chaotic frameworks and their possible applications to the field of cryptography has become extensive consideration amid the most recent years in a part of mainstream community. Chaotic frameworks are undoubtedly described by delicate dependence on beginning conditions and closeness to arbitrary behavior, properties which appear to be basically comparative required by a couple of cryptographic primitives (Kocarev 2001).

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Even et al. (1989) announced the idea of online/offline signatures. Their scheme implements the signature generation process in two steps. The primary step is executed offline, and the next step is carried out online. Even et al. also demonstrated a general procedure for remodeling any signature approach into an online/offline signature approach in Even et al. (1989). But, the procedure is unworkable meanwhile it raises the measure of the signature by a quadratic variable. Later, Shamir and Tauman (2001) demostrated another perspective known as "hash-sign-switch" for planning additional economical online/offline signature techniques. Above mention procedures are in nonspecific setting, and thus it is not truly sensible or economical to be utilized. Few concrete executions have been proposed in Kurosawa and Schmidt-Samoa (2006), Chen et al. (2007a, b), Joye (2008), Boneh and Boyen (2008) and Gao et al. (2016). Between these methods, Joye (2008) and Kurosawa and Schmidt-Samoa (2006) are proven secure without random oracles, while Boneh and Boyen (2008) is the most efficient one.

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Operation on Fine Topology

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Abstract. This paper introduces the concept of an operation γ on τ_f. Using this operation, we define the concept of f_γ-open sets, and study some of their related notions. Also, we introduce the concept of $f_\gamma g$.closed sets and then study some of its properties. Moreover, we introduce and investigate some types of f_γ-separation axioms and $f_{\gamma\beta}$-continuous functions by utilizing the operation γ on τ_f. Finally, some basic properties of functions with f_β-closed graphs have been obtained.

2010 Mathematics Subject Classifications: 54A05, 54A10, 54C05, 54C10, 54D10

Key Words and Phrases: Fine-open sets, f_γ-open sets, $f_\gamma g$.closed sets, f_γ-separation axioms, $f_{\gamma\beta}$-continuous functions, f_β-closed graphs

1. Introduction

Kasahara [11] introduced the notion of an α operation approaches on a class τ of sets and studied the concept of α-continuous functions with α-closed graphs and α-compact

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SUCCESSION OF CULTURABLE MICROBES ON RHIZOSPHERE SOIL OF IRON ORE MINED OVERBURDEN DUMP IN DALLI RAJHARA, DURG, CHHATTISGARH, INDIA

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Abstract

The assessment of microbiological changes that occur during the maturation of overburden dump in iron ore mined. Dalli Rajhara overburden dump was located in Balod dist. of Chhattisgarh. 0, 3, 7, 8 and 9 year old OB dump was planted by different agencies. Rhizosphere soil was collected from different planted and natural growing planted species. Our results indicate that over time, the microbiologically disturbed overburden dump leads to the development of microbial communities that approximate those of undisturbed soil. When the age of dump were increase number of bacteria and fungi was increased in all age overburden dump. Different plant growth promoting rhizobacteria (PGPR) *Rhizobium* sp., *Azospirillum* sp., *Azotobacter* sp. and fluorescent *Pseudomonas* sp. was isolated. In 0 year dump (fresh dump) these bacteria was completely absent and *Azotobacter* sp. was completely absent in all year OB dump.

Key words : Mining, microorganism, plantation, succession.

Introduction

Iron ore is one of the most common minerals on the nutrients, which facilitate the subsequent establishment of plant communities (Schulz *et al*., 2013). Microbes play

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Quinoline and pyrazolone functionalized *cis*-dioxomolybdenum(VI) complexes: synthesis, hyphenated experimental-DFT studies and bactericidal implications

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ABSTRACT

A new series of mixed-ligand complexes of dioxomolybdenum(VI) of the general composition $[MoO_2(L)(8\text{-hq})(H_2O)]$, where *8*-hq=*8*-hydroxyquinoline and LH=4-acylpyrazolones *viz*, 3-methyl-1-phenyl-4-propionyl-2-pyrazolin-5-one (pmphpH), 4-butyryl-3-methyl-1-phenyl-2-pyrazolin-5-one (bumphpH), *4-iso*-butyryl-3-methyl-1-phenyl-2-pyrazolin-5-one (*iso*-bumphpH) or 4-benzoyl-3-methyl-1-phenyl-2-pyrazolin-5-one (bmphpH) has been synthesized by the reaction of $[MoO_2(acac)_2]$ and the target ligands in ethanol medium. The complexes have befmken characterized by elemental analyses, decomposition temperature, molar conductance, magnetic susceptibility, thermogravimetric studies, FT-IR, UV-vis, ^{1}H NMR, ^{13}C NMR, and FAB mass spectral studies. The thermal decomposition processes of one complex, *cis*-$[MoO_2(iso\text{-bumphp})(8\text{-hq})(H_2O)]$ has been discussed with the evaluation of the order of reaction (*n*) and the activation energy (E_a) calculated from the thermogravimetric (TG) curve. Antibacterial study of one of the synthesized complexes at various dilutions has also been carried in comparison with the ligands and metal precursor using ampicillin as a standard drug. Gaussian09 software package was employed to carry out the theoretical study using density functional theory DFT/B3LYP level of theory under LANL2MB (for Mo)/6-311+G (for non-metallic elements) basis set for one of the complexes, *cis*-$[MoO_2(bmphp)(8\text{-hq})(H_2O)]$. Based on experimental and theoretical data, suitable pseudo pentagonal bipyramidal structures have been proposed for this class of metal complexes.

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cis-Dioxomolybdenum(VI) complexes; antimicrobial activity; DFT calculation

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cis-Dioxomolybdenum(VI) complex of N-*o*-hydroxyacetophenonene-isonicotinic acid hydrazide as nosocomial anti-infectious agent: experimental and theoretical study

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ABSTRACT

Due to growing resistance and continuous colonization among microbes, researchers are eager to design and put forth antibiotic substances of effective anti-nosocomial infection activity. Under such purview, the current report deals with synthesis and formulation of a dioxomolybdenum(VI) complex of general formula $[MoO_2(L)(H_2O)]$, where H_2L = N-(*o*-hydroxyacetophenone)isonicotinic acid hydrazide (H_2haina), as antibiotic compound against hospital acquired infections. The complex was characterized by elemental analysis, conductance determination, magnetic susceptibility measurements, Proton Nuclear Magnetic resonance spectroscopy (^{1}HNMR), Fourier-transform Infra-red spectroscopy (FTIR), mass spectrometry, thermal and electronic spectral studies. Experimental data results were compared with theoretical outcomes by invoking density functional theory-based molecular topography and conjoint spectroscopic analysis with the help of Gaussian09 software package using LANL2DZ/B3LYP combination for the cis-dioxo group of distorted octahedral complex, $[MoO_2(haina)(H_2O)]$. The experimental and theoretical outcomes were found in an excellent agreement with one another. The overall study reveals that the complex under investigation possesses a *cis*-dioxo-octahedral geometry. Significant antimicrobial activity of the complex was obtained against hospital origin microbes in comparison with some selected standard commercial drugs induding tetracydine and azithromydin. *E. Coli and Pseudomonas* were the microbes selected for the study.

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cis-Dioxomolybdenum(VI); ^{1}HNMR; NBO and HOMO–LUMO; nosocomial

1. Introduction

Oxomolybdates represent fascinating molecular scaffolds for their significant structural diversity and multifold applications in material science, catalysis, biology and medicine. [1] Molybdoenzymes catalyze so many biologically relevant redox reactions.[2] Compounds of this metal have been found significant in treating Wilson's disease [3], hyperglycemia [4] and also show anticancer potential.[5] Hence, this class of compounds has

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ORIGINAL PAPER

Statistical evaluation of rainfall time series in concurrence with agriculture and water resources of Ken River basin, Central India (1901–2010)

Sarita Gajbhiye Meshram [1,2] · Sudhir Kumar Singh [1] · Chandrashekhar Meshram [3] · Ravinesh C. Deo [4] · Balram Ambade [5]

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Abstract
Trend analysis of long-term rainfall records can be used to facilitate better agriculture water management decision and climate risk studies. The main objective of this study was to identify the existing trends in the long-term rainfall time series over the period 1901–2010 utilizing 12 hydrological stations located at the Ken River basin (KRB) in Madhya Pradesh, India. To investigate the different trends, the rainfall time series data were divided into annual and seasonal (i.e., pre-monsoon, monsoon, post-monsoon, and winter season) sub-sets, and a statistical analysis of data using the non-parametric Mann–Kendall (MK) test and the Sen's slope approach was applied to identify the nature of the existing trends in rainfall series for the Ken River basin. The obtained results were further interpolated with the aid of the Quantum Geographic Information System (GIS) approach employing the inverse distance weighted approach. The results showed that the monsoon and the winter season exhibited a negative trend in rainfall changes over the period of study, and this was true for all stations, although the changes during the pre- and the post-monsoon seasons were less significant. The outcomes of this research study also suggest significant decreases in the seasonal and annual trends of rainfall amounts in the study period. These findings showing a clear signature of climate change impacts on KRB region potentially have implications in terms of climate risk management strategies to be developed during major growing and harvesting seasons and also to aid in the appropriate water resource management strategies that must be implemented in decision-making process.

1 Introduction

The agricultural sector in India is heavily reliant on sustained and reasonable amount of rainfall. The present study area Ken River basin (KRB) is very much prone to frequent drought events with meteorological, hydrological, and agricultural consequence including it impacts on edaphic and socioeconomic activities. Taken together, drought affects the primary productivity in the KRB region. Water is an essential input for the sustenance of all living entities (Gajbhiye et al. 2014; Singh et al., 2013a; Singh et al. 2015); therefore, a good knowledge of water balance over local, regional, national, and continental scales in a large nation such as India is required for various decision-making tasks. The demand for fresh water is continuously rising due to the unprecedented population growth, high rate of urbanization, unplanned industrialization, over-exploitation, and people's attitude towards water utilization and water savings (Gajbhiye et al. 2015a). Timely availability of quality water is necessary to improve food and social, and this can help avoid the migration of people from rural to urban areas during water-stressed periods (Jain and Kumar 2012).

The Intergovernmental Panel on Climate Change (IPCC

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Cancer molecular markers: A guide to cancer detection and management

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Research Article

EVALUATION OF ANTIBACTERIAL ACTIVITY OF ENDOPHYTIC FUNGI *ASPERGILLUS JAPONICUS ISOLATED FROM TRIDAX PROCUMBENS* L.

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ABSTRACT

Objective: The main purpose of the present study was to isolate the endophytic fungi from *Tridax procumbens* L. and evaluate their antibacterial activity at different concentration of compatible solvents extracted metabolites against the test pathogenic bacterial strain, as well as the molecular characterization of potent endophytic fungal isolate that showed the maximum antibacterial activity.

Methods: The endophytic fungi were isolated from the different parts of the collected *T. procumbens* plant. Screening of endophytic fungi for the antibacterial activity was scrutinized against five pathogenic bacteria such as *Bacillus subtilis, Streptococcus pyogenes, Escherichia coli, Klebsiella pneumoniae,* and *Salmonella typhimurium* using agar well diffusion method. After screening, the metabolite of the potent fungal isolate was extracted using different solvents by solvent-solvent extraction procedure and observed their antibacterial activity. For molecular identification of the fungi, the DNA was extracted, quantified, and amplified using two oligonucleotide primers ITS4 and ITS6 in polymerase chain reaction.

Results: In the present study, five endophytic fungi were isolated from medicinal plant *T. procumbens* and screened for their antibacterial activity

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ORIGINAL PAPER

Application of cubic spline in soil erosion modeling from Narmada Watersheds, India

Sarita Gajbhiye Meshram[1] · Pournima Laxman Powar[1] · Vijay P. Singh[2] · Chandrashekhar Meshram[1]

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Abstract
Soil erosion by water is ubiquitous, exhibits spatio-temporal variability, and is fundamental to determining sediment yield which is key to proper watershed management. In this study, we propose a relationship between the curve number and sediment yield index (SYI) using cubic splines. Using field data from four watersheds, the relation between observed and computed SYI is found to have a coefficient of determination (R^2) value from 0.63 to 0.88 suggesting that such a relation can be used to determine SYI from the available CN value. It is found that cubic splines perform satisfactorily with Nash-Sutcliff efficiency ranging from 60.18 to 64.01%, absolute prediction error from 1.35 to 5.56%, integral square error from 1.21 to 5.82%, coefficient of correlation from 79.32 to 93.78%, and degree of agreement from 0.87 to 0.99%.

Keywords Cubic spline interpolation · Watershed · Runoff curve number (CN) · Sediment yield index (SYI)

Introduction

Soil, water, and vegetation are the most vital natural resources (Sharma et al. 2014b; Meshram et al. 2017b; Meshram and Powar 2017). The prosperity and history of a nation depends on a great extent on these resources and their management. Due to scarcity of water and cultivable land, it has become essential to make optimum use of available resources which can be achieved through efficient use of water and treatment of the land. About 175 M ha of land in India constitutes around 53% of the total geographical area, affected from land degradation and soil erosion (Shit et al. 2015). Inadequate management of cultivated land and infringement of forest/pasture lands aggravate soil erosion, furthering. Runoff and sediment are two important hydrologic consequence of rainfall occurring over watersheds. Remote sensing technology and geographic information systems (GIS) substantially aid the analysis of land use, hypsometric analysis, and prioritization for watershed planning and modeling (Sharma et al. 2013a, b; Sharma et al. 2014a).

Notably, the watersheds or hydrological units are measured more proficient and appropriate for fundamental overview and probe for the judgment of natural resources, for example water, and subsequent program and carrying out of various development plans (Mishra et al. 2013). Several empirical equations, such as Universal Soil Loss Equation (USLE) (Wischmeier and Smith 1978) and SCS-CN curve number method, often used in watershed management. Without measured sediment data, a sediment yield index expressing the relative sediment yield from different drainage area formed the base for grading the watershed in order of priority for soil and water conservation measures (Bali and Karale 1977). The suitability of the SYI methodology is based on some previous studies (Kothyari and Jain 1997; Pal 1998; Bhuyan et al. 2002; Pandey et al. 2007; Gajbhiye et al. 2015). A treatment-oriented land use

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Full length article

Inter and intraspecific genetic diversity (RAPD) among three most frequent species of macrofungi (*Ganoderma lucidum*, *Leucoagricus* sp. and *Lentinus* sp.) of Tropical forest of Central India

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ABSTRACT

In present study seven RAPD primers were used to access the diversity within and among twelve populations of three mushroom species *Ganoderma lucidum*, *leucoagaricus* sp. and *Lentinus* sp. Total of 111 bands were scored by 7 RAPD primers in 30 accessions of three mushroom species collected from different sampling sites of central India. Total 111 bands were generated using seven primers which were F-1, OPG-06, OPC-07, OPD-08, OPA-02, OPD-02, OPB-10. All 111 bands were polymorphic in nature (100%). Therefore, it revealed that the used primers had sufficient potency for population studies and 30 accessions had higher genetic differences among each other. In best of the knowledge, this is the first report, which accesses the genetic diversity between three mushroom species (*Gd Ganoderma lucidum*, *Lg Leucoagaricus* sp., *Ls Lentinus*). The polymorphic percentage ranged from 3.60 to 23% within twelve populations, while polymorphic percentage among group was 40.56, among population within groups was 41.12 and within population was 18.32. This indicated that the genetic diversity within the population was very low, but slightly higher in the populations of three species. Among three groups representing *Gd.*, *Lg* and *Ls*, Among populations within groups shown highest percentage of variation (*Pv* = 41.12) while

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An Overview
Contaminated

Abhishek Kumar Awasthi, Jinhui Li, Akhilesh Kumar Pandey & Jamaluddin Khan

Chapter | First Online: 26 May 2018

1239 Accesses | **6** Citations

Abstract

The soil contamination due to open disposal of municipal solid waste has become a serious issue particularly in the developing countries. Several studies have revealed variable impacts of pollutant toxicity on the environment and exposed inhabitants. This chapter provides an

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A calcium-stimulated serine peptidase from a true-branching cyanobacterium, *Westiellopsis ramosa* sp. nov

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The dynamic of cellulase activity of fungi inhabiting organic municipal solid waste

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Review

Allergy genuflection? It's surmount with special focus on ear, nose and throat

D. Gupta [a], L. Deshmukh [a], R. Gupta [b], S.S. Sandhu [a]

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Abstract

The system that protects body from infectious agents is immune system. On occasions, the system seldom reacts with some foreign particles and causes allergy. Allergies of the ear, nose and throat (ENT) often have serious consequences, including impairment and emotional strain that lowers the quality of life of patients. This is further responsible for the common cold, cough, tonsillitis, dermal infection, chest pain and asthma-like conditions which disturb one's day to day life. The present review enlightens some common ENT allergies which one can suffer more frequently in one's lifetime, and ignorance leads to making the condition chronic. Information regarding pathophysiology and the management of ENT allergy by this review could help clinicians and common people to better understand the circumstances and treatment of ENT allergy.

Introduction

The inappropriate immune response to an allergen is known as allergy.[28] Broadly speaking, the inordinate reaction of the immune system against fungi, parasites, foreign particles like foreign organisms, organic molecules, dust, chemicals etc. leads to allergy. These foreign particles enter through the respiratory tract and react abnormally to the body cells.[70] This may also be defined as the hypersensitivity reactions of our body cells initiated by specific immunological mechanisms against particular particles. Hypersensitivity is a reproducible symptom or signs rudiment by exposure to a powerful stimulus at a dose tolerated by an individual.[36] The type-1 hypersensitivity reactions are encouraged by the non-scrounging antigen, i.e. allergen, in atopic individuals. In this type of hypersensitivity response cells like tissue mast cells and blood basophils are sensitised by the interaction with a Fc receptor of an IgE antibody produced in opposition to allergen. When the same allergen exposes again then crosslinking of bound IgE on sensitised cells occurs and this results in the degranulation of the allergen. The active mediators like histamines, leukotrienes and prostaglandins results in the contraction and vasodilation in smooth muscles and nearby tissues.[3] In developed countries, allergic diseases are of great public health concern.[55] The organs that show localised

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Ball impact induced elastico-mechanoluminescence for impact sensor

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Induced Pluripotent Stem Cell Technology: A Paradigm Shift in Medical Science for Drug Screening and Disease Modeling

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Soft Comput
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FOUNDATIONS

A secure key authentication scheme for cryptosystems based on GDLP and IFP

Chandrashekhar Meshram[1,2] · **Cheng-Chi Lee**[3,4] · **Chun-Ta Li**[5] · **Chin-Ling Chen**[6]

Abstract The advancement of public-key cryptography in recent years has offered strong background support for the invention of numerous new system applications vastly employed in electronic business as well as other fields. However, that does not change the fact that the one-and-only Internet still remains open and unprotected. Therefore, for the sake of information security, confirming the legality of an entity's public key is always critical. Typically, a key authentication scheme needs one or more authorities to authenticate keys. To make a difference, in this study, we have developed a new key authentication scheme using generalized discrete logarithm problem and integer factorization problem for cryptosystems. Although the new scheme works pretty much the same way as regular certificate-based techniques, it differs in that it needs no authority. Taking the password/secret key pair as the certificate of public key for an entity, the new key authentication technique is very simple but profoundly secure.

Keywords Public-key cryptosystem · Authentication scheme · Integer factorization problem (IFP) · Certificate-based scheme · Generalized discrete logarithm problem (GDLP)

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1 Introduction

The rise of public-key cryptography tackled the issue of secure key agreement in routine symmetric key cryptography (Diffie and Hellman 1976; Wang et al. 2015; Wei et al. 2014). Moreover, it makes possible the creation of more advanced digital signature schemes. With the help of the innovations in public-key cryptography, electronic commerce of various kinds over open systems has become more and more conceivable and workable (Chang et al. 2009; He et al. 2013, 2015, 2016a, b; Hu et al. 2015, 2016; Jing et al. 2014; Liu et al. 2006, 2014a; Yao et al. 2015). In a typical public-key cryptographic scheme, each entity has a key couple, namely a secret key and a public key. Public keys are generally kept collectively in an open document such as a public-key manual, which is huge in size and yet fully exposed. A gatecrasher can simply trace an entity by replacing his/her public key with a fake key, unless there is a secure key authentication scheme to help watch the door. So far, quite a number of key authentication schemes have been developed and presented. For the

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ORIGINAL ARTICLE

Westiellopsis ramosa sp. nov., intensely branched species of *Westiellopsis* (cyanobacteria) from a freshwater habitat of Jabalpur, Madhya Pradesh, India

Prashant Singh[1] · Neelam Dubey[2] · Suvendra Nath Bagchi[2]

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Abstract An axenic culture of a cyanobacterium (strain HPS) was raised from a field specimen of greenish planktonic floccose mass from a local lake, Ganga Sagar. Intense morphological examination and comparative morphological assessment with the genera *Fischerella* and *Hapalosiphon* and all the known strains of the genus *Westiellopsis* indicated that the strain HPS differed in morphology with the closely related strains in trichome arrangement, size of vegetative cells, heterocytes, monocytes, and number of rows of main filaments. There were also differences in the habitat preference, being aquatic rather than terrestrial or subaerial. Intense ecological characterization of the habitat was performed through measurements of important physicochemical characteristics. 16S rRNA gene-based identification and phylogenetic placement indicated conclusively that the strain HPS was different from the most closely related strain *Westiellopsis prolifica* SAG 16.93. Phylogenetic inferences drawn in between all the branched heterocytous forms and subsequent 16S-23S ITS analyses and folding of the secondary structures revealed an entirely new form that is unknown till now. Subsequent *nif*D and *rbc*L gene-based phylogenetic assessments indicated that strain HPS is phylogenetically different from all the other previously known species of true branching cyanobacteria, along with also pointing toward the huge database inconsistencies in case of true branched cyanobacteria. Assessment of morphological and ecological differences along with comprehensive phylogenetic evaluation indicated that the strain HPS is a new species of the genus *Westiellopsis* and the name being proposed is *Westiellopsis ramosa* sp. nov.

Keywords 16S rRNA sequence analogy · Phylogenetic tree · Polyphasic approach · True branching cyanobacteria · *Westiellopsis*

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Introduction

According to the bacteriological classification (Rippka et al. 1979; Anagnostidis and Komárek 1990; Castenholz 2001), true branching heterocytous cyanobacteria belonging to Subsection V (order Stigonematales) differ from Subsection IV (order Nostocales) on the basis of the plane of cell division. Longitudinal and oblique divisions bring about creeping branching out of transversely dividing main trichome. The true branching cyanobacteria display considerable morphological variation in shapes and dimensions of the cells, number of layers of cells and branching types. Gugger and Hoffmann (2004) classified the Stigonematales into a clade of four clusters separating on the basis of Y- and T-branching. Hoffmann et al. (2005) regrouped the orders Nostocales and Stigonematales into one subclass Nostochopycideae, as they were found to be monophyletic. Komárek et al. (2014) revised the taxonomic position applying a polyphasic approach, combining

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Allergy genuflection? It's surmount with special focus on ear, nose and throat

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› Int J Syst Evol Microbiol. 2017 Sep;67(9):3329-3338. doi: 10.1099/ijsem.0.002112. Epub 2017 Sep 4.

Phylogenetically distant clade of Nostoc-like taxa with the description of Aliinostoc gen. nov. and Aliinostoc morphoplasticum sp. nov

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› Chem Biol Interact. 2017 Aug 25;274:35-49. doi: 10.1016/j.cbi.2017.07.001. Epub 2017 Jul 6.

Arginase purified from endophytic Pseudomonas aeruginosa IH2: Induce apoptosis through both cell cycle arrest and MMP loss in human leukemic HL-60 cells

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› Environ Sci Pollut Res Int. 2017 Jul;24(20):17250-17254. doi: 10.1007/s11356-017-9412-8. Epub 2017 Jun 26.

Municipal solid waste leachate impact on metabolic activity of wheat (Triticum aestivum L.) seedlings

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› 3 Biotech. 2017 Jun;7(2):118. doi: 10.1007/s13205-017-0762-1. Epub 2017 May 31.

Hot springs of Indian Himalayas: potential sources of microbial diversity and thermostable hydrolytic enzymes

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Topological and morphological analysis of gamma rays irradiated chitosan-poly (vinyl alcohol) blends using atomic force microscopy

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Reverse indentation size effects in gamma irradiated blood compatible blend films of chitosan-poly (vinyl alcohol) for possible medical applications

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An IND-ID-CPA Secure ID-Based Cryptographic Protocol using GDLP and IFP

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Abstract. ID-based cryptographic protocol is an extremely valuable apparatus in the field of cryptography and has numerous latent applications. The safety of conventional ID-based cryptographic protocol is entirely contingent in light of the safety of private keys. Revelation of private keys needs reissuing all beforehand doled out encryptions. This confinement turns out to be clearer today as key presentation is more regular with expanding utilization of unprotected gadgets and mobile technology. In this context, relieving the loss of key disclosure in ID-based cryptographic protocol is a critical issue. To manage this issue, we present to include onward security into ID-based cryptographic protocol. Besides, we propose another development of indistinguishability-ID-based cryptographic protocol using Integer Factorization Problem (IFP) and Generalized Discrete Logarithm Problem (GDLP) which is semantically protected against Chosen Plaintext Attack (CPA) in random oracle. We show that our presented protocol beats the other standing protocol as far as security, the length

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Patents on Endophytic Fungi

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Original Article

Estimation of Guggulsterone E and Z in the Guggul-based Commercial Formulations Using High-performance Thin-layer Chromatography

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ABSTRACT

Background: Guggulsterone (GS) is a plant steroid and bioactive compound present in gum Guggul of *Commiphora wightii*. An Indian herbal medicine system "Ayurveda" has a long history of use of gum Guggul and plant extract of *C. wightii* as medicine for the treatment of various illnesses. Complex nature, low availability, and inconsistency of phytoconstituents make its analysis of difficult tasks. **Aims:** In this work, six different Guggul-based herbal formulations were examined for estimation of GS and their isomers (E and Z) through high-performance thin-layer chromatography technique. **Materials and Methods:** For that various concentrations of standard E-GS and Z-GS (50 ng–250 ng/spot) with samples (20 µg/spot) were applied on silica gel coated aluminum plate and developed with the mobile phase of toluene: ethyl acetate: formic acid: methanol (6:2:1:0.5). The scanning was performed at 254 nm wavelength and the absorbance (scan) spectrum of E-GS and Z-GS peak was generated at 200 nm–400 nm wavelength range. **Results and Conclusions:** R*f* value and scan spectrum pattern of the samples reveal that they contain either one form of GS (E-GS, Z-GS) or both. The quantity of E-GS and Z-GS within the samples was ranged from 0.230 ± 0.0040–0.926 ± 0.0168% to 0.537 ± 0.0026–0.723 ± 0.0177%, respectively.

KEYWORDS: *Absorbance (scan) spectrum, Commiphora wightii, guggulsterone, herbal formulation, high-performance thin-layer chromatography*

INTRODUCTION

For the past few decades, compounds from natural sources have been gaining importance because of their vast chemical diversity, and many of them are being used as a medicine. Herbal based medicines used for its quality assessment.[3] The WHO has taken a keen interest in the quality control of herbal medicine and recommends the use of high-performance thin-layer chromatography (HPTLC) for the characterization and quality assurance of herbal medicines.[3]

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Structure and antioxidant superoxide dismutase activity of copper(II) hydrazone complexes

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Keywords: Mixed ligand complexes, antioxidant SOD mimics, X-ray analysis, electron paramagnetic resonance(epr) spectra, cyclic voltammetry (CV)

ABSTRACT : Three new mixed ligand hydrazone complexes viz., [Cu(L)(neocuprin)]$NO_3.H_2O$ **1**, [Cu(L)(HL)]ClO_4 **2** and [Cu_2(2-(2-pyridyl)benzimidazole)$_2$(L)$_2$]ClO_4 **3** (L = *N*'-[(*E*)-phenyl(pyridin-2-yl)methylidene]furan-2-carbohydrazide) have been synthesized by the biomimetic synthesis strategy and their structures were determined by single crystals X-ray analysis. The effect of differing contagious, as well as the rotational conformational versatility of HL, was demonstrated by the difference in structures of complexes **1-3**. These complexes exhibited the antioxidant superoxide dismutase enzymatic activity. The geometry of copper(II) atom in complex **1** is distorted square pyramidal while in complexes **2** and **3** the geometries around copper(II) atoms are distorted octahedral. Magnetic measurements and epr spectroscopy of binuclear complex **3** have shown antiferromagnetic exchange interaction with a coupling constant (J) = -10.87 cm^{-1}. Electronic and spectral properties of these newly synthesized hydrazone complexes (**1-3**) are interpreted by DFT and TDDFT calculations. The results reveal that molecular structures have significant effect on antioxidant superoxide activity. Such biological experimental values (antioxidant SOD activity data) are indicative of the promising

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Conjoint experimental–theoretical evaluation of pyrone-salicylic acid hydrazide copper(II) Schiff base complexes: their synthesis, SOD and electrochemical fronts

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ABSTRACT

Superoxide dismutase in relation to Alzheimer's disease can be thought as the basis for the development of copper coordination complexes designed as radiopharmaceuticals to assist in the diagnosis/treatment of this disorder. In such a fascination, a systematic study of a series of three Cu(II)-N-dehydroacetic acid-salicylic acid hydrazide (H_2dha-shz) Schiff base complexes, based on hyphenated experimental and theoretical approach, having the general composition formula as [Cu(dha-sahz)(L)], where L is H_2O, imidazole (imdH)] or benzimidazole (bimdH) is presented. Theoretical calculations have been performed for one of the representative complexes containing imidazole as a co-ligand. B3LYP/LANL2DZ combination was used to carry out the required calculations. From the study, a suitable square planar geometry has been found for the complexes under investigation. In addition to the density functional theory (DFT)-experimental formulation of target metallic systems, superoxide dismutation and electroactivity were also determined to add valuable interests to the objective of the study. The results have shown satisfactory superoxide scavenging potential and redox flexibility among the complexes. Moreover, theoretical charge topography analysis has also been discussed in relation to the biological effect.

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KEYWORDS
Copper(II); B3LYP/LANL2DZ; SOD; spectroscopy

1. Introduction

Copper is one of the most important metals found in biosystem and is ranked among essential nutrients existing as vital constituent in many active sites of metalloproteins, necessary to support aerobic eukaryotic life. The World Health Organization recommends a minimal acceptable Cu intake of approximately 1.3 mg/day. Biological implications of copper include electron shuttling/trafficking, small-molecule processing, oxidative transformation of biological/organic substrates, activation/production of neurotransmitters and hormones, as well as production and scavenging of reactive oxygen species (ROS) (superoxide dismutase (SOD).[1–5] In the current times, major areas of focus involve the bioinorganic chemistry of copper including coordination and spectroscopic properties of

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Research paper

Urinary tract infection fighting potential of Newly synthesized ruthenium carbonyl complex of *N*-dehydroacetic acid-*N*′-*o*-vanillin-ethylenediamine

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ABSTRACT

In recent years, there has been a growing fascination towards the development of new antimicrobial agents from various sources to combat microbial resistance. *Klebsiella pneumonia* and *E. coli* are the main urinary tract infection (UTI) causing agents. Herein, we report the synthesis and characterization of a novel carbonyl complex of Ru(II) that has been found a good antimicrobial agent against the selected microbes. Hence, may be suggested as potent agent against UTI. The compound on characterization was found octahedral in structure on the basis of comparative DFT-experimental characterization. Molecular specification under B3LYP functional, LANL2DZ basis set for Ru atom and 6-31 g(d,p) for all other atoms were employed. Electron density plots and geometrical optimization were the main theoretical aspects that were invoked. Elemental analysis, mass spectrometry, NMR, FT-IR, UV–Vis and cyclic voltammetry were the physio-chemical techniques at both the experimental and theoretical fronts that helped to establish the proposed structure. From the overall study, it may be remarked that both observed and computed outcomes have been found in good agreement with each other.

1. Introduction

Biological relevance of ruthenium carbonyl complexes has attracted scientists to verify its DNA binding and anti-carcinogenic potential [1]. Complexes bearing Ru metallic core have shown excellent redox properties [2]. The investigated role of general co-ligands like hydride, carbonyl, chloride, and triphenylphosphine of this class of catalysts explored through density functional theory (DFT) have suggested some key measures involved in their reactivity. Hence may be used as a precursor for the synthesis of the new monophosphine carbonyl ruthenium coordination compounds [3]. The metal–metal linking behaviour upon protonation [4], catalytic activities of olefin metathesis [5] and other important evidences suggest ruthenium compounds to be efficient catalysts [6].

On the other side ethylene diamine (*en*), *o*-vanillin and dehydroacetic acid are frequently investigated molecules. *o*-Vanillin possesses well documented antimutagenic effects [7] and is considered as a dietary antimutagen that effectively inhibits both induced and spontaneous mutations [8]. Due to the presence of hydroxyl moieties in these ligands (excluding *en*) efficient insecticidal behaviour is expected on performing their molecular docking [9]. *O*-Vanillin has also been reported previously to bind amyloid or to modulate protein aggregation that links the molecule with the prevention of Alzheimer's disease (AD) [10]. Metal chelation of such organic molecules results in developing interesting materials [11]. DNA binding, antiproliferative activities and fluorescence measurements have brought tremendous scientific investigation under such purview [12,13]. The compound has been remarkably used in synthesizing pyrazole derivatives [14]. In association with other ligands it has been found that ketonic compounds could enhance the luminescence intensity, quantum yield and lifetime of coordinated complexes [15]. In addition to displaying desirable material properties, the beneficial mutational effect [16], cardiovascular tone [17] and antimicrobial action [18–20] of this class of compounds is really amazing.

The diamine ligand known as ethylene diamine used in the present work specializes the formation of a Schiff base containing two azomethine functionalities. The interest was sought because of good metal anchoring ability of salen type ligands to open fascinating fronts [21,22]. Ethylene diamine based metal complexes have also indicated high level of non-interactive Calf Thymus (CT)-DNA binding mode [23]. Schiff bases have been found to exhibit photochromism and fluorescent switching properties by

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Research paper

Urinary tract infection fighting potential of Newly synthesized ruthenium carbonyl complex of *N*-dehydroacetic acid-N′-*o*-vanillin-ethylenediamine

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ABSTRACT

In recent years, there has been a growing fascination towards the development of new antimicrobial agents from various sources to combat microbial resistance. *Klebsiella pneumonia* and *E. coli* are the main urinary tract infection (UTI) causing agents. Herein, we report the synthesis and characterization of a novel carbonyl complex of Ru(II) that has been found a good antimicrobial agent against the selected microbes. Hence, may be suggested as potent agent against UTI. The compound on characterization was found octahedral in structure on the basis of comparative DFT-experimental characterization. Molecular specification under B3LYP functional, LANL2DZ basis set for Ru atom and 6-31 g(d,p) for all other atoms were employed. Electron density plots and geometrical optimization were the main theoretical aspects that were invoked. Elemental analysis, mass spectrometry, NMR, FT-IR, UV–Vis and cyclic voltammetry were the physio-chemical techniques at both the experimental and theoretical fronts that helped to establish the proposed structure. From the overall study, it may be remarked that both observed and computed outcomes have been found in good agreement with each other.

1. Introduction

Biological relevance of ruthenium carbonyl complexes has attracted scientists to verify its DNA binding and anti-carcinogenic potential [1]. Complexes bearing Ru metallic core have shown excellent redox properties [2]. The investigated role of general co-ligands like hydride, carbonyl, chloride, and triphenylphosphine of this class of catalysts explored through density functional theory (DFT) have suggested some key measures involved in their reactivity. Hence may be used as a precursor for the synthesis of the new monophosphine carbonyl ruthenium coordination compounds [3]. The metal–metal linking behaviour upon protonation [4], catalytic activities of olefin metathesis [5] and other important evidences suggest ruthenium compounds to be efficient catalysts [6].

On the other side ethylene diamine (*en*), *o*-vanillin and dehydroacetic acid are frequently investigated molecules. *o*-Vanillin possesses well documented antimutagenic effects [7] and is considered as a dietary antimutagen that effectively inhibits both induced and spontaneous mutations [8]. Due to the presence of hydroxyl moieties in these ligands (excluding *en*) efficient insecticidal behaviour is expected on performing their molecular docking [9]. *O*-Vanillin has also been reported previously to bind amyloid or to modulate protein aggregation that links the molecule with the prevention of Alzheimer's disease (AD) [10]. Metal chelation of such organic molecules results in developing interesting materials [11]. DNA binding, antiproliferative activities and fluorescence measurements have brought tremendous scientific investigation under such purview [12,13]. The compound has been remarkably used in synthesizing pyrazole derivatives [14]. In association with other ligands it has been found that ketonic compounds could enhance the luminescence intensity, quantum yield and lifetime of coordinated complexes [15]. In addition to displaying desirable material properties, the beneficial mutational effect [16], cardiovascular tone [17] and antimicrobial action [18–20] of this class of compounds is really amazing.

The diamine ligand known as ethylene diamine used in the present work specializes the formation of a Schiff base containing two azomethine functionalities. The interest was sought because of good metal anchoring ability of salen type ligands to open fascinating fronts [21,22]. Ethylene diamine based metal complexes have also indicated high level of non-interactive Calf Thymus (CT)-DNA binding mode [23]. Schiff bases have been found to exhibit photochromism and fluorescent switching properties by

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Structure and antioxidant superoxide dismutase activity of copper(II) hydrazone complexes

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ABSTRACT

Three new mixed ligand hydrazone complexes viz., $[Cu(L)(neocuprin)]NO_3{\cdot}H_2O$ **1**, $[Cu(L)(HL)]ClO_4$ **2** and $[Cu_2(2\text{-}(2\text{-pyridyl})benzimidazole)_2(L)_2]ClO_4$ **3** (L = *N*-[(*E*)-phenyl(pyridin-2-yl)methylidene]furan-2-carbohydrazide) have been synthesized by the biomimetic synthesis strategy and their structures were determined by single crystals X-ray analysis. The effect of differing contagious, as well as the rotational conformational versatility of HL, was demonstrated by the difference in structures of complexes **1**–**3**. These complexes exhibited the antioxidant superoxide dismutase enzymatic activity. The geometry of copper(II) atom in complex **1** is distorted square pyramidal while in complexes **2** and **3** the geometries around copper(II) atoms are distorted octahedral. Magnetic measurements and epr spectroscopy of binuclear complex **3** have shown antiferromagnetic exchange interaction with a coupling constant (J) = −10.87 cm^{-1}. Electronic and spectral properties of these newly synthesized hydrazone complexes (**1**–**3**) are interpreted by DFT and TDDFT calculations. The results reveal that molecular structures have significant effect on antioxidant superoxide activity. Such biological experimental values (antioxidant SOD activity data) are indicative of the promising application of these complexes into the bioinorganic chemistry of superoxide dismutase.

1. Introduction

Antioxidant superoxide dismutases (SOD) are endogenous and first line defense enzymes that contain either Cu–Zn, Fe, Mn or Ni at the active site of these metalloenzymes. A large number of mononuclear Cu^{II}, dinuclear Cu^{II}–Cu^{II} or Cu^{II}–Zn^{II} low molecular weight complexes have been synthesized as superoxide dismutase mimics to emulate the structure and function of metal binding sites [1–15]. The synthesis of low molecular weight model compounds to mimic the active site of metalloenzyme has been an active area of research in the last few decades. However, these model complexes in homogeneous solution are still somewhat sensitive to the environments and they show lower activity and selectivity than the corresponding natural metalloenzymes. The main function of the metalloprotein backbone plays important roles in site-isolation, nanoconfinement and substrate duct to facilitate a specific catalytic function. Therefore, further integration of a scaffold with a model metal complex catalytic system would be most desirable to better mimic the structure and reactivity of metalloenzyme. For the ongoing integration of appropriate ligation with metal complex, site-isolation and confinement can be achieved by appropriate design of the periphery of ligands allowing for effective catalysis to be tethered to a scaffold to achieve site-isolation and introduction of neighboring functionality to simulate the local environment of active center of the metalloenzyme [16]. All living organisms consume molecular oxygen as the ultimate oxidant supporting cellular respiration, but a considerable portion of molecular oxygen is metabolized through the one electron reduction product, superoxide anion (O_2^-). Respiring organisms have involved a system of defense against these dangerous metabolites which allows them to enjoy the benefits of living in an oxygen-rich environment. As a part of this protective arsenal, antioxidant superoxide dismutase are present in aerobes to catalyze the conversion of superoxide anion into H_2O_2 and O_2 (Eqs. (1) and (2) and Scheme 1).

$$ME^{ox} + O_2^- \rightarrow ME^{red} + O_2 \quad (1)$$

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Corrosion resistance and thermal behavior of acetylacetonato-oxoperoxomolybdenum(VI) complex of maltol: Experimental and DFT studies

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Abstract

Corrosion and thermo-chemistry is a prominent discipline of physical science. In the conspicuous fascination to design potent durable materials herein, we report the synthesis of an oxoperoxomolybdenum(VI) complex containing maltol and acetylacetone as co-ligands. Magnetic susceptibility measurements, FAB mass spectrometry, FT-IR spectroscopy and thermal analysis are the main characterization techniques that have been used to arrive at the proposed structure of the compound. Experimental data have been compared with density functional theory (DFT) based theoretical outcomes by applying B3LYP functional, and basis set LanL2DZ for Mo and 6311 + G for all other atoms. A close agreement has been found between computed data and the experimental results. From the overall study, it can be found that the complex bears hepta-coordinate pseudo-pentagonal bipyramidal geometry. Based on combined experimental-DFT calculations, the possible role of the complex in designing smart materials has been evaluated. In addition to satisfactory anticorrosive potential, thermo-gravimetry based excellent heat resistance has been shown by the complex. The article also focuses on the calculation of various thermodynamic and kinetic parameters of the respective pyrolysis (TG curve).

Keywords: Oxoperoxomolybdenum(VI); DFT; HOMO; LUMO; MESP

1. Introduction

Molybdenum is involved in the structure of certain bio-catalysts carrying out redox reactions [1,2]. Many compounds of this metal are applicable in the treatment of Wilson's disease [3], controlling diabetes [4] and also exhibit marvelous anti-carcinogenic properties [5]. The polyoxomolybdenum scaffolds represent excellent catalysts applicable in solid-state technology [6–9]. In order to design materials having thermal resistance and anti-corrosive properties, recently molybdenum oxo-derivatives have attained considerable attention [10–13]. Fabrication of new compounds of this framework having fascinating structural properties is a preferential focus in the modern era [14–16].

Metal complexes of maltol have been shown to possess diversified applications [17–21]. Diketonic compounds, like acetylacetone is referred as a class of potent metal-anchoring ligands that has widened the

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An eco-friendly approach for minimizing pollution of metal from municipal solid waste leachate in India

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Effect of salinity on Brassica rapa var. toria (BRSRT) under selenium defence: A trial to assess the protective role of selenium

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Abstract

The present study assesses the role of selenium, an antioxidant in salt-stressed plants. A hydroponic trial of sodium selenate (Na_2SeO_4) on the growth, oxidative stress and antioxidant protection system of *Brassica rapa* var. *toria* (BRSRT) plant was studied. 40 µmol and 100 µmol of Na_2SeO_4 were hydroponically applied to BRSRT roots with 50 mmol and 100 mmol sodium chloride (NaCl) for 12 days. Plant growth, biomass production and photosynthetic pigments at 100 mmol salt stress was inhibited while oxidative stress indicators, for example, hydrogen peroxide and lipid peroxidation were stimulated. Supplementation of 40 µmol Na_2SeO_4 with 50 mmol and 100 mmol NaCl improved growth, photosynthetic pigments and acted as an antioxidant by inhibiting lipid peroxidation and increasing superoxide dismutase, ascorbate peroxidase, catalase, glutathione peroxidase, glutathione reductase activities. The in-gel assays also showed enhanced activities of these enzymes. At 100 µmol concentration, selenium under salt stress, repressed growth and expression of antioxidant enzymes and stimulated oxidative stress with enhanced glutathione peroxidase activity. Under consolidated stress treatment, an addition of 40 µmol Na_2SeO_4 was the most effective for both NaCl concentrations. The finding reveals that the optimal selenium supplementation presents a promising potential for use in conditions of relatively high levels of NaCl stress for BRSRT seedlings.

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Full Length Research Paper

Antioxidant modulation in response to selenium induced oxidative stress in unicellular cyanobacterium *Synechococcus elongatus* PCC 7942

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A unicellular cyanobacterium *Synechococcus elongatus* PCC 7942 was exposed to various concentrations of SeO_4^{2-}. A growth supportive effect was seen at 50 µM concentration of SeO_4^{2-} whereas 50% growth retardation was observed at 200 µM of SeO_4^{2-}. Selenium (Se) stress at 200 µM SeO_4^{2-} induced the formation of reactive oxygen species such as superoxide radical ($O_2^{\cdot-}$), hydrogen peroxide (H_2O_2) and malondialdehyde (MDA). Modifications in antioxidant enzyme levels, namely, superoxide dismutase (SOD), catalase (CAT), peroxidase (POX), glutathione reductase (GR), glutathione peroxidase (GPX) and isozyme patterns were also examined. This article outlines the synergistic action

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TAXONOMIC DESCRIPTION

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MICROBIOLOGY SOCIETY

Phylogenetically distant clade of *Nostoc*-like taxa with the description of *Aliinostoc* gen. nov. and *Aliinostoc morphoplasticum* sp. nov.

Suvendra Nath Bagchi,[1] Neelam Dubey[1] and Prashant Singh[2,*]

Abstract

Nostoc is a complex and tough genus to differentiate, and its morphological plasticity makes it taxonomically complicated. Its cryptic diversity and almost no distinguishable morphological characteristics make this genus incredibly heterogeneous to evaluate on taxonomic scales. The strain NOS, isolated from a eutrophic water body, is being described as a new genus *Aliinostoc* with the strain showing motile hormogonia with gas vesicles as an atypical feature, which is currently considered as the diacritical feature of the genus but should be subjected to critical evaluation in the near future. The phylogenetic placement of *Aliinostoc* along with some other related sequences of *Nostoc* clearly separated this clade from *Nostoc sensu stricto* with high bootstrap support and robust topology in all the methods tested, thus providing strong proof of the taxa being representative of a new genus which morphologically appears to be *Nostoc*-like. Subsequent phylogenetic assessment using the *rbc*L, *psb*A, *rpo*C1 and *tuf*A genes was done with the aim of facilitating future multi-locus studies on the proposed genus for better taxonomic clarity and resolution. Folding of the 16S–23S internal transcribed spacer region and subsequent comparisons with members of the genera *Nostoc*, *Anabaena*, *Aulosira*, *Cylindrospermum*, *Sphaerospermopsis*, *Raphidiopsis*, *Desmonostoc* and *Mojavia* gave entirely new secondary structures for the D1-D1′ and box-B helix. Clear and separate clustering from *Nostoc sensu stricto* supports the establishment of *Aliinostoc* gen. nov. with the type species being *Aliinostoc morphoplasticum* sp. nov. in accordance with the International Code of Nomenclature for algae, fungi and plants.

INTRODUCTION

Traditionally, the genus *Nostoc* has been placed under the thick peridermal layer capturing a mass of filaments. The two means of vegetative propagation are fragmentation of

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Westiellopsis ramosa sp. nov., intensely branched species of *Westiellopsis* (cyanobacteria) from a freshwater habitat of Jabalpur, Madhya Pradesh, India

Prashant Singh, Neelam Dubey & Suvendra Nath Bagchi

Plant Systematics and Evolution **303**, 1239–1249 (2017) | Cite this article

Abstract

An axenic culture of a cyanobacterium (strain HPS) was raised from a field specimen of greenish planktonic floccose mass from a local lake, Ganga Sagar. Intense morphological examination and comparative morphological assessment with the genera *Fischerella* and *Hapalosiphon* and all the known strains of the genus *Westiellopsis* indicated that the strain HPS differed in morphology with the closely related strains in trichome arrangement, size of vegetative cells, heterocytes, monocytes, and number of rows of main filaments. There were also differences in the habitat preference, being aquatic rather than terrestrial or subaerial.

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Distribution of microcystin synthetase genes in filamentous cyanobacterial phytoplankton and production of microcystin in water samples collected from Eastern Madhya Pradesh, India

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Abstract

The important value index, which is sum of relative abundance, biovolume and frequency, was calculated for different cyanobacterial genera present in phytoplankton scum/mat material in ten water bodies located in three districts of Eastern Madhya Pradesh. All such scum/mat samples were dominated by cyanobacteria mostly belonging to the genera Oscillatoria, Anabaena, Nostoc, Phormidium and Spirulina. The microcystin synthetase genes (mcyABDE) were detected in all cyanobacterial scum/mats samples indicating that toxic genotypes of cyanobacteria constituted the populations. Despite ubiquitous presence, mcy genes displayed quite a patchy distribution pattern, and rarely all the four genes were present together. Present study showed amplification of mcyA (80%), mcyB (60%), mcyD (50%) and mcyE (80%) genes. The dissolved microcystin content in the waters harbouring cyanobacterial populations was determined by semi-quantitative ELISA. About 30% water bodies contained the free microcystins below 0.5 ppb, whereas the remaining ones showed presence of the toxin in a range of 0.5-3.0 ppb. These values are well below 1 µg L^{-1} microcystin, a benchmark set for safe use of water for drinking and recreational purposes according to WHO guidelines.

Keywords: Biodiversity, Agarose gel electrophoresis, ELISA, Microcystin, PCR amplification.

Introduction

Microcystin is produced by bloom forming toxigenic water, irrigation, fishing, recreation and aquatic food products. Moreover, microcystin accumulating into food chain leads to many diseases in human and animals[13-15]. In this paper we

भारतीय कृषि अनुसंधान पत्रिका, 32(4), **295-299**, 2017

पालतु पशुओं के गुणसूत्र प्रारूपों के अध्ययन की मानक संचालन प्रक्रिया

तिलक राम, संदीप राहॅगडाले*, रवि राज*, अजीत प्रताप सिंह*, धर्मेन्द्र कुमार*, कॉजल जाधव*, बिकासचन्द्र सरखेल*, एवं सुवेन्द्र नाथ बागची****

पशु जैव प्रौद्योगिकी केंद्र, नानाजी देशमुख पशु चिकित्सा विश्वविद्यालय, जबलपुर (म.प्र),

सारांश

गुणसूत्र (क्रोमोसोम्स) शब्द की उत्पत्ति ग्रीक भाषा से हुई है, जिसमें कलर (क्रोमा) तथा बाडी (सोमा) से है। वैज्ञानिक समुदाय ने गुणसूत्र शब्द की अवधारणा इसलिए दिया क्योकि ये कोशिका सरंचना है जिसे देखने हेतु रंगीन रंजको से रंगा जाता है। गुणसूत्र एक धागेनुमा सरंचना है जोकि मनुष्यों, जानवरों व पौधों के कोशिकाओं के केन्द्रक में पाया जाता है। प्रत्येक गुणसूत्र प्रोटीन व डीएनए अणुओं से निर्मित होते हैं जो उसे उसके माता-पिता द्वारा हस्तांतरित होते हैं। डीएनए में विशिष्ट निर्देश होते हैं जो प्रत्येक प्रकार के जीवित प्राणियों को अद्वितीय बनाते हैं ये गुणसूत्र कोशिका विभाजन के समय हुबहू दूसरे संतति कोशिका में स्थानांतरित होते हैं इस दौरान कभी-कभी इनकी संख्या अथवा संरचना में कुछ परिवर्तन उत्पन्न हो जाते हैं जिससे कई गंभीर समस्या उत्पन्न हो जाती हैं। इस अधय्यन के लिए हमने उत्तक नमूने नगर निगम जबलपुर द्वारा संचालित पशुवध गृह व सर्जरी विभाग नानाजी देशमुख पशुचिकित्सा विश्वविद्यालय जबलपुर से संग्रहित किया इसके पश्चात पशु जैव प्रौधोगिकी केंद्र नाना. दे.वि.वि में संपूर्ण प्रकिय्रा सम्पादित किया। इस हेतु हमने तीन पालतू प्रजाति के पशुओं बकरी, बिल्ली एवं भैंस के उत्तक नमूने से इन विट्रो विधि द्वारा कोशिका का संवर्धन किया व गुणसूत्र प्रारूप विधि द्वारा अनुवांशिक विकारों को जानने हेतु गुणसूत्र प्रारूपों का अध्ययन किया। इस अध्ययन में हमने पाया की तीनों पशुओं में किसी तरह का कोई विकार नहीं हैं व ये अनुवांशिक स्तर पर स्वस्थ हैं। इस अध्ययन का प्रयोग आर्थिक लाभ देने वाले पशुओं हेतु किया जा सकता है, ताकि उनके अनुवांशिक स्तर पर स्वस्थ होने की पहचान की जा सके व स्वस्थ एवं उन्नत किस्म के पशुओं का उपयोग किया जा सके।

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STANDARD OPERATING PROCEDURE OF CHROMOSOMAL IDENTIFICATION FOR DOMESTIC ANIMALS

Tilak Ram, Sandeep Rahangdale*, Ravi Raj*, Ajit Pratap Singh *, Dharmendra Kumar*, Kajal Jadhav*, Bikash Chandra Sarkhel* and Suvendra Nath Bagchi****

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Full Length Research Paper

Antioxidant modulation in response to selenium induced oxidative stress in unicellular cyanobacterium *Synechococcus elongatus* PCC 7942

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A unicellular cyanobacterium *Synechococcus elongatus* PCC 7942 was exposed to various concentrations of SeO_4^{2-}. A growth supportive effect was seen at 50 µM concentration of SeO_4^{2-} whereas 50% growth retardation was observed at 200 µM of SeO_4^{2-}. Selenium (Se) stress at 200 µM SeO_4^{2-} induced the formation of reactive oxygen species such as superoxide radical ($O_2^{\cdot-}$), hydrogen peroxide (H_2O_2) and malondialdehyde (MDA). Modifications in antioxidant enzyme levels, namely, superoxide dismutase (SOD), catalase (CAT), peroxidase (POX), glutathione reductase (GR), glutathione peroxidase (GPX) and isozyme patterns were also examined. This article outlines the synergistic action

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Equivalent circuit models using CPE for impedance spectroscopy of electronic ceramics

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ABSTRACT

Complex immittance (Impedance Z, Modulus M, Admittance Y, Permittivity ε) spectra for some equivalent circuit models involving resistances, capacitances and constant phase angle elements (CPE) are calculated for different ratios of the parameters. A comparison of experimentally obtained complex immittance plots with these diagrams greatly facilitates the search for the most appropriate equivalent circuit representing the electrical properties of electronic ceramics. An equivalent circuit for $Ba_{1-x}Sr_xTiO_3$ ($x = 0.35$) ceramic system is developed by using these simulated plots.

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Impedance spectroscopy; ceramic; constant phase angle elements (CPE); equivalent circuit model; CNLS

1. Introduction

Electronic ceramics are technological materials having vast variety of applications such as actuators and sensors, computers memories, electrically controlled microwave tuning devices for RADAR applications etc and are playing key role in electronics industry today [1–3]. In actual practice the ceramics are integrated to some other systems or components. A prior knowledge of an equivalent circuit suitable to represent their behavior in a given frequency range may greatly facilitate the overall optimum design of the systems. In the study of electrical behavior of ceramics Impedance Spectroscopy is being increasingly used which, in turn, is proving to be very useful for obtaining equivalent circuit models also [4–6]. In this technique, depending upon the possible charge transfer processes thought to be present in the material, suitable equivalent circuits are chosen to represent the electrical behavior by comparing the experimental plots with the simulated ones for various model circuits. Usually combinations of resistances (R) and capacitances (C) suffice for dielectrics, combinations of R and inductance L suffice for magnetic systems and combinations of R, L and C suffice for ferro/piezoelectrics [4–17]. Sometimes it is found that the lumped – component – type of models do not yield good fits and their simulated patterns do not show even qualitative resemblance with the

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Reverse indentation size effects in gamma irradiated blood compatible blend films of chitosan-poly (vinyl alcohol) for possible medical applications

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ABSTRACT

In the present work binary blends of polyvinyl alcohol (PVA) and chitosan (CS) were prepared by solution cast method and characterized by analytical methods like FTIR, XRD and SEM for seeking structural and morphological information. The blends were exposed to gamma radiation and evaluated for their improved mechanical strength. It was found that the tensile strength and microhardness increased after irradiation of CS-PVA films. Plastic effect due to absorption of water molecules and scissoring effect due to gamma irradiation were found to decrease the softness or increase the microhardness of the blends. Improved mechanical properties were attributed to intermolecular and intramolecular hydrogen bonds and adhesive nature of the blends also. The blends were also investigated for water intake behavior and in vitro blood compatibility property on the basis of certain in vitro tests like protein adsorption, haemolysis and blood clot formation on the un-irradiated and irradiated blend samples. The increased % swelling with time could be assigned to the fact that increasing water content facilitates the phase separation process within the blend which results in advancement in interstitial nano-void spaces which are occupied by water molecules. The blood compatibility results showed that when the amount of CS was varied from 0.5% to 2%, the amount of blood clot and percent haemolysis decreased while the protein adsorption increased with increasing CS content of the blend films.

1. Introduction

Judicious combination of synthetic polymers and biological macromolecules as a binary blend not only enhances the mechanical and structural properties but also improves the biocompatibility and biodegradability of the end products. In order to achieve biocompatibility, hydrophilic/hydrophobic polymers must possess well accepted physiological criteria for intended medical applications [1,2]. Intermolecular and intramolecular interactions between the constituent polymers make the resulting blends so special that many of the properties change significantly from individual components. When these material surfaces come into contact with the blood, the formation of clot is the most undesirable but frequently occurring event that restricts the clinical acceptance of a material to be used as biomaterial [3]. Therefore, some parameters need be examined for ascertaining hemofriendly nature of biomaterial polymers. Surface-induced thrombosis which is preceded by plasma protein adsorption and haemolysis which results in breakdown of RBCs are the eventual happenings when materials are put in contact with the flowing blood for medical applications [4]. Among several determinants of blood compatible nature of polymer biomaterials, the hydrophilicity of the polymers plays a key role. The extreme hydrophilic polymer blend surfaces have been reported to offer minimum protein adsorption and, consequently, low thrombus formation [5].

Poly (vinyl alcohol) (PVA) is well known for its hydrophilicity; however, blending with other potential biocompatible materials may significantly enhance its blood compatibility [6]. Chitosan (CS) is a pseudo-natural polymer synthesized from exoskeleton of shrimps, fungi, insects, annelids, and mollusks [7]. Due to its inherent properties like biocompatible, biodegradable, nontoxic, mucoadhesive, hemostatic, hypocholesterolemic, hypolipidemic, antimicrobial , immunoadjuvant, antiviral, and antitumoral nature, it is widely used in the field of medicine and pharmacy [8–10]. CS also has good film forming properties and when it contacts with blood, it does not lead to blood clot formation [11]. However, the mechanical properties of CS are not quite good and, therefore, applications where a variety of different shapes for the biological applications are required; the CS will not give fair performance

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Topological and morphological analysis of gamma rays irradiated chitosan-poly (vinyl alcohol) blends using atomic force microscopy

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ABSTRACT

In the present communication, binary blends of poly (vinyl alcohol) (PVA) and chitosan (CS) were prepared by solution cast method and the roughness parameters of PVA, native CS and CS-PVA blend films were determined using atomic force microscopy (AFM). Moreover, the changes in the morphology of the samples were also investigated after irradiation of gamma rays at absorbed dose of 1 Mrad and 10 Mrad for the scanning areas of 5×5 μm^2, 10×10 μm^2 and 20×20 μm^2. Amplitude, statistical and spatial parameters, including line, 3D and 2D image profiles of the experimental surfaces were examined and compared to un-irradiated samples. For gamma irradiated CS-PVA blends the larger waviness over the surface was found as compared to un-irradiated CS-PVA blends but the values of average roughness for both the films were found almost same. The coefficient of skewness was positive for gamma irradiated CS-PVA blends which revealed the presence of more peaks than valleys on the blend surfaces.

1. Introduction

Developing new biocompatible materials has emerged as an inter-disciplinary area of research where materials science and biomedical fields overlap to design well architectured molecular assemblies of great potential finding a wide spectrum of biomedical applications ranging from drug delivery systems to artificial implants. Among several approaches of fabricating biocompatible materials, high energy radiations e.g. gamma rays, has been the most effective strategy in medical and pharmaceutical domains (Shahabi et al., 2014). The ultimate properties of the irradiated films depend greatly on the nature and structure of target materials as well as the dose of the radiation used. Some of the observed changes may be related to the formation of clusters due to cross-linking, chain scission and formation of new chemical linkages or breaking up of chemical bonds (Katare et al., 2014). Exposure to gamma radiation results in an enhanced cross-linking of the polymer networks and affects surface morphology by rearrangement of macromolecular chains by inter-molecular forces.

Chitosan (CS) is a natural polysaccharide biopolymer which is mainly used in wound healing agent as a cream, dressing excipient, and skin adhesive (Chhatri et al., 2011; Paul and Sharma, 2004; Silva et al., 2008). Blending of CS with synthetic polymers like poly (vinyl alcohol) (PVA) imparts desirable characteristics to the resulting material for numerous biomedical and environmental applications (El-Hefian et al., 2013). It is reported that blending of CS with PVA enhances not only its biocompatibility but also hydrophilicity and mechanical properties of the film in comparison to the native CS polymer film (Parida et al., 2011; Azizi et al., 2014). The biocompatible nature of CS and good film forming property of PVA offer possibilities of designing blends of these two polymers that may find applications in the areas like wound healing, burn dressing matrices and other biomedical applications. Since morphology of the surfaces also plays a key role in determining blood compatible nature of the material, it is desirable to investigate the topographical and morphological investigation of a blend of the CS and PVA. A further enhancement in blood compatibility may also be brought about by irradiation of the blend with gamma rays.

Nouman and coworkers described the impact of biological responses e.g. cytotoxicity, inflammation, thrombosis etc. with body tissues when they contact with different surfaces of the experimental samples (Nouman et al., 2016). Good adhesion of the red blood cells and good cohesions of the platelets have been reported by the due modifications in the surface morphology of the films (Albu et al., 2011). Similarly the surface modification of magnesium alloy was found to improve the blood compatibility of the material (Pan et al., 2017).

The treatment of the AFM data and analysis are the basic requirements while studying topography of a film surface (Konovalova et al.,

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Structural, Thermal and Mechanical Insights of Polyphenylene oxide (PPO)/ Polystyrene (PS) polymer blends

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Abstract: The effect of addition of PPO into PS matrix on thermal behavior was studied using differential scanning calorimetry (DSC) technique; mechanical characterization by Microhardness study and polymer blend surfaces structure has been studied using atomic force microscopy (AFM). The pure polymeric samples and their blends of ratio 95:05; 90:10; 85:15; and 80:20 weight percentage has been prepared using solution casting techniques. It is found in AFM studies that due to the disruption of phenyl ring associated with polystyrene the surface topography characteristic of each constituent are destroyed upon mixing by interpenetrating poly (phenylene oxide) chains. On the basis of DSC, the glass transition temperature of the samples was determined. It is found that the glass transition temperature initially increases up to 10 wt% of PPO; however, it decreases with further increase in PPO content in the sample., Microhardness study shows that all the polymer blends have high H_v value as compared to pure PS but the H_v value for pure PPO is maximum.

Keywords: Poly (Phenylene Oxide) (PPO), Poly (Styrene) (PS), XRD, DSC, AFM, Microhardness

1. INTRODUCTION

The thermal properties (like glass transition temperature, melting point) and surface structure of polymer systems are directly related to its application in various fields (like electrical circuits, medical applications, insulation, signal transmission, shielding etc.) and needs to take into account during use of polymers. Conceivably the most explicit criterion of polymer compatibility is the detection of a single glass transition temperature whose temperature is intermediate between those corresponding to the two-component polymers. For the bulk blend systems, PPO and PS are known to be compatible in all compositions [1].

Immiscible polymer blends exhibit two glass transitions at temperatures around those of the components. Partially miscible systems are heterogeneous two-phase structure, in which only a limited amount of the other component is dissolved in both phases. Two T_gs, in these polymer pairs approach each other but do not become identical. Completely miscible blends result in homogeneous structure and exhibit a single T_g between the T_g of the individual components. Based on readily available polymers, the unusual polymer blends with a combination of properties unattainable in any single polymer component are obtainable. For instance, Completely miscible poly(2,6-dimethylphenylene oxide)/polystyrene (PPO/PS) blends having good dimensional stability, high resistance to moisture, impact resistance, low temperature impact strength, low creep, and good processability [2] are widely used in automotive instrument panels, interior finishing, business equipment chassis, electrical applications, and medical equipment. Therefore, it is significant to develop polymer blend.

Hardness is a measure of how resistant solid matter is to various kinds of permanent shape change when a compressive force is applied. Some materials, such as metal, are harder than others. For elastomers and some polymers hardness is defined as the ability of the material to resist plastic deformation. It is a complex property related to various mechanical properties such as modulus, strength, elasticity, plasticity etc. Polymers are different from other material like metals and ionic solids because in polymeric material strain depends not only on the magnitude of the stress but also on the length of time during which it is applied. The chemical and morphological nature of the material is one of the very important property on which microhardness of the material is dependent and, therefore, by properly selecting the component of the material, the hardness of the material may be desirably balanced.

2. EXPERIMENTAL SECTION:

2.1 Materials

The materials used in the present investigation are Polyphenyleneoxide (PPO) and Polystyrene (PS) in powder form was supplied by M/S Fine CHEM Industries Mumbai. The solvents Acetone and Benzene of AR grade were supplied by M/S Aldrich Chemicals, Mumbai.

2.2 Preparation of Blends:

Blend films of PS and PPO in different compositions were prepared using solvent cast technique by taking PS and PPO in 95:05; 90:10; 85:15; and 80:20 weight % ratios, the sample thickness ranging from 20 to

Polarization Behaviour of Polyvinylidenefluoride-Polysulfone (PVDF: PSF) Blends Under High Field and High Temperature Condition

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Abstract. Thermally stimulated discharge currents of PVDF: PSF blend samples in ratio 80:20 and 95:05 prepared by the solution cast technique have been studied as a function of polarizing field and polarizing temperature, the temperature corresponding to a peak in TSDC is found to be independent of polarizing field but dependent on the polarizing temperature.

INTRODUCTION

Thermally stimulated discharge current (TSDC)[1,2] studies reveal the information about the charge storage mechanisms and are also very useful for the study of different relaxations in polymers, composites and blends.

Many polymeric blends have been found and reported over the last few decades. Polymeric blends of Polyvinyledene fluoride (PVDF) and Polysulfone (PSF) is one such important blends. PVDF is a polar semicrystalline polymer which has drawn both scientific and technological attention because of its useful piezo-and pyro-electric properties. It is also one of the rarest polymers that exhibits diverse crystalline forms having at least five phases namely α, β, γ, δ and ε [3-4].

Polysulfone are in other hand a class of amorphous engineering polymers with excellent thermal, mechanical, chemical and hydrolytic stability, though it is hydrophobic. The polymer has been a material of interest for researchers for many decades [5-13].

In polar material charge storage is mainly due to orientation of aligned dipoles, whereas in amorphous material it is due to space charge.

Electrical behavior of polymeric blends of PSF and PVDF containing higher percentage of PVDF has been investigated by [14-16]. They have attributed the observed polarization behavior primarily to induced dipoles for Low field and temperature. Further such studies for high PVDF content for high Poling field and temperature are still sparse. Hence in present investigations, an attempt has been made to study the charge storage mechanism in a PVDF: PSF blend samples in different ratio 80:20 and 95:05.

EXPERIMENTAL

The commercial PVDF (Solef 1015 PVDF Powder) and PSF (UDEL P1700 PSF granuals) used for the present study were by Redox Ltd. (India). The weight-average molecular weight of PVDF is 2, 61, 000 and that of PSF is 66, 000. The samples for the present investigation were prepared by the solution cast technique. Blend samples of thickness approximately 15 -25 μm and of wt% compositions PVDF PSF:: 80:20; 85:15; 90:10 and 95:05 were prepared.

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Study of observed Broad Dielectric Relaxation and compatibility of Polysulfone - Polyvinylidenefluoride blends

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Abstract. Short circuit thermally stimulated depolarization current measurement techniques has been employed to investigate the dielectric relaxation behavior of PSF: PVDF blends. The samples taken were blends of composition PSF: PVDF:: 80:20; 85:15; 90:10 and 95:05 percent by weight. The thermograms were characterized by a high value of initial current, a low temperature peak around 75-80°C and a prominent broad peak in the temperature interval 130 to 160°C. The two polymers are found to form compatible blend in the studied composition range.

INTRODUCTION

A study on polymeric blends is important from the point of view of understanding morphology- property relationship or properties in relation to the crystalline and amorphous content of the polymer [1-3].

The thermally stimulated discharge current (TSDC) method has been used successfully to study the various mechanisms of polarization and also charge storage phenomena in polymer electrets [4].

Polysulfone and Polyvinyledene fluoride is one such important blend. Polysulfone are a class of amorphous engineering polymer with excellent thermal, mechanical, chemical and hydrolyte stability [5-9].

PVDF on the other hand is a semicrystalline polymer which has drawn both scientific and technological attention because of its useful piezo and pyro-electric properties. It is also one of the rarest polymer that diverse crystalline forms at least five phase namely α, β, γ, δ and ε [5-6].

Electrical behavior of polymeric blends of PSF and PVDF containing higher percentage of PVDF has been investigated by Saxena *et. al* [10-11]. They have attributed the observed polarization behavior primarily to induced dipoles for low field and temperature. It, however, appears that the mechanism responsible for the relaxation behavior of such blends is not completely understood. Further, such studies on these blends are still sparse for higher field and temperature [10-12].

EXPERIMENTAL

The commercial PSF and PVDF used for the present study were supplied by Redox Ltd. (India). The samples for the present investigation were prepared by the solution cast technique. The solution of particular concentration was prepared by dissolving the two polymers PSF and PVDF in different weight ratios in their common solvent DMF. Blend samples of wt% compositions PSF: PVDF:: 80:20; 85:15; 90:10 and 95:05 designated as PB1, PB2, PB3 and PB4 respectively, were prepared. For TSDC measurements samples were polarized with fields of E_P = 100, 150, 200 and 250 kVcm^{-1} at temperatures T_P = 60, 75, 90 and 115°C. After polarizing for 45 min at the desired temperature, the sample was cooled to room temperature in the presence of field. The total time of polarization was adjusted to be 90min in each case. TSDC cycles were obtaining the thermally activated release of frozen-in polarization. The pre-

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Dielectric Relaxation Behaviour of (Poly (Vinyl Formal)) (PVFO) and Polyvinylidenefluoride (PVDF) Blends

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Abstract. Thermally stimulated discharge currents in PVFO: PVDF blend samples of weight percentage ratio 80:20 and 95:05 prepared by the solution cast technique have been studied as function of polarizing temperature. Three distinct peaks are found at 60±10, 100±10, and 140 ±10 °C respectively. Activation energy values been calculated by initial rise method and it were found to range from 0.22 to 1.0 eV.

INTRODUCTION

In recent years considerable attention has been shown to the study of polymeric blends. A proper selection and combination of polymeric components in an appropriate ratio might result in a material with optimal properties for specific applications in microelectronics and engineering.

Many techniques including thermal analysis and scattering methods have been used to look at microscopic and macroscopic phenomena with regard to morphology crystallization and interfacial properties. TSDC is a powerful technique with sensitively comparable to dynamic mechanical and dielectric loss measurements. Further, for semicrystalline materials, the low equivalent frequency offers one additional advantage. The glass transition temperature Tg is shifted to low temperature and the glass transition of the purely amorphous phase can be studied without inducing crystallization [1-9]

Hence in the present investigations, an attempt has been made to study the charge storage mechanism in a weakly polar substance (poly (vinyl formal)) (PVFO) and a semi crystalline polar Polyvinylidenefluoride (PVDF) blends in ratio PVFO: PVDF:: 80:20 and 95:05.

EXPERIMENTAL

The commercial and PVFO and PVDF used in the present study supplied by Redox Ltd. (India).The samples for the present investigation were prepared by the solution cast technique. Blend samples of wt% compositions PVFO: PVDF:: 80:20; 85:15; 90:10 and 95:05 were prepared.

For TSDC measurements bimetallized samples were polarized with fields of 100, 150, 200 and 250 $kVcm^{-1}$ at temperatures 60, 75, 90 and 105^{0}C. After polarizing for 45 min at the desired temperature, the sample was cooled to room temperature in the presence of field. The total time of polarization was adjusted to be 90 min in each case. The TSDC in short circuit of the samples thus charged were obtained by reheating the samples at linear rate of approximately 3^0Cmin^{-1} and the depolarization current was measured by means of a sensitive electrometer Keithley Electrometer (610 C).

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Crystalline and Absorption Studies on PMMA/CdS Composite Using XRD & UV-Vis Techniques

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Abstract. The composite of PMMA and CdS powder were prepared by solution casting technique after sonication for 60 min. The Crystallinity Index, Interplanar Distance, Crystallite Size, Average Inter Crystalline Separation and Energy Band Gap have been estimated for the prepared samples. The crystallinity index is increasing from 39.74% for pure PMMA to 41.45% for 1%CdS+PMMA composite film. The crystallite size is decreasing with increasing the concentration of CdS. The energy band gap of Pure PMMA from absorption spectra was found to be 4.542eV, which decreases with concentration of CdS powder within PMMA matrix.

INTRODUCTION

Polymer composite provides an excellent route to engineering new properties in materials using available polymer and inorganic material. From polymer composite it is possible to produce a range of materials with properties that are superior to that of each individual component polymers. Poly(methyl methacrylate) (PMMA) has received much attention in current decades because of its exceptional physical and chemical properties. This has resulted in a wide range of scientific and industrial applications [1]. In this work, PMMA/CdS composite films were prepared using solution cast with various concentrations of CdS. The crystalline properties of CdS/PMMA composite films with CdS at different concentrations were investigated using X-ray diffraction and absorption studies were studied using UV-Vis Spectroscopy [2,3].

EXPERIMENTAL DETAILS

Material Used in Present Study

PMMA of molecular weight 15000 was obtained from HiMedia Laboratories Pvt. Ltd. Mumbai, India, and Cadmium Sulfide (CdS) of molecular weight 144.48 was obtained from Research Lab Fine Chem. Industries, Mumbai, India. The Benzene crystallisable used as PMMA solvent was purchased from Thomas Baker (Chemicals) Pvt. Ltd. Mumbai, India.

Preparation of Samples

The solvent cast technique was adopted for preparation of pure and composite samples. The specimen of pure PMMA, 0.2%CdS+PMMA, 0.4% CdS+PMMA, 0.6% CdS+PMMA, 0.8% CdS+PMMA, 1.0% CdS+PMMA in the presence of Benzene as a solvent. The solution was constantly stirred with the help of electronics stirrer for

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Synthesis and Crystalline Properties of CdS Incorporated Polyvinylidene Fluoride (PVDF) Composite Film

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Abstract. This paper gives an insight on the synthesis and crystalline properties of Polyvinylidene Fluoride (PVDF) (host matrix) composites impregnated with Cadmium Sulphide (CdS) using Dimethyl formamide (DMF) as the base, prepared by the well known solvent casting technique. The effect of doping concentration of CdS in to the PVDF matrix was studied using X-ray diffraction technique. The structural properties like crystallinity C_r, interplanar distance d, average size of the crystalline region (D), and average inter crystalline separation (R) have been estimated for the developed composite. The crystallinity index, crystallite size and inter crystalline separation is increasing with increase in the concentration of CdS in to the PVDF matrix while the interplanar distance d is decreasing.

INTRODUCTION

The attention of scientists is acquired by polymers due to their technological applications and various properties [1]. Polymers have significant potential in various aspects as a result of their versatile properties. Polymer materials have been widely used in various fields such as industrial products. They also have potential advantages for applications in optical storage systems, such as high thermal stability, low absorption loss and the ability of refractive index changing upon exposure to light [2].

PVDF is a crystalline fluorinated thermoplastic of very high purity which exhibits excellent chemical resistance to mineral and organic acids, hydrocarbons and solvents. It's mechanical toughness, very low moisture absorption, wide range of service temperature from -40^{0}C to 150^{0}C, good wear resistance, low coefficient of friction, resistance to UV, self extinguishing nature and transparency to radiation renders it useful in host of applications in chemical processing, food, pharmaceutical and paper manufacturing [3]. Polyvinylidene Fluoride (PVDF) has outstanding properties such as high thermal stability, good chemical resistance and membrane forming properties due to these it has been extensively applied to scientific research and industrial processes. PVDF exhibits four crystalline phases α, β, γ, δ [4, 5, 6].The present paper reveals the effect of doping of CdS in PVDF on crystalline properties.

EXPERIMENTAL DETAILS

Material Used in Present Study

Dimethyl formamide was purchased from Thomas Baker (Chemicals) Pvt. Limited, Mumbai – 400 002, India. Cadmium Sulphide was purchased from Research-Lab Fine Chem Industries, Mumbai - 400 002, India. PVDF was purchased from Himedia Chemical, Mumbai and used without further purification.

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Variation of Micro-Hardness of Titanium Oxide Doped Poly (Methyl Methacrylate) Composite samples with Different Annealing Temperature

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Abstract. The variation of micro-hardness of titanium oxide doped poly (methyl methacrylate)compositesamples with different annealing temperature is reported in the present work.Poly (methyl methacrylate) samples have been used as the host material in which titanium oxide is added in different weight % of doping (0%,0.0001%, 0.0005%, 0.005%, 0.001%, 0.05%, 0.01%). The sample preparation was done by solution casting method. For the present studies Vicker's micro-hardness test has been used. The sample is subjected to loads of 10-200 grams.

INTRODUCTION

Hardness measures material resistance to indentation. The term 'hardness' can have various meanings in different contexts, for example implying resistance to elastic deformation in the case of elastomeric materials or resistance to groove formation in scratching[1].Hardness is known as "Resistance of solid material to plastic deformation", usually by indentation. However, the term may also refer to stiffness or temper or to resistance to scratching, abrasion, or cutting. It is the property of a solid, which gives it the ability to resist being permanently, deformed (bent, broken, or have its shape changed), when a load is applied. The greater the hardness of the solid, the greater it has resistance to deformation. Hardness measurement does not depend on a single physical property, but it involves both the elastic and plastic deformation characteristics of materials. PMMA is frequently preferred because of its moderate properties, easy handling and processing, and low cost. The micro hardness technique was used for many years for characterization of such "classical materials" as metals, alloys and inorganic glasses. Its application to polymeric materials developed during the last several decades [2].For the present studies Vicker's micro hardness test has been used. This test uses a square pyramid of diamond in which the included angles *a* between non-adjacent faces of the pyramid are 136°. The hardness is given by

$$H_v = 1.854\,\frac{P}{d^2}$$

where *P*is the force in Kg and *d* is the mean diagonal length of the impression in millimeters. The value of H_v is expressed in Kg/mm^2. The force is usually applied at a controlled rate, held for 30 s, and then removed [3-6].

MATERIALS

Polymethyl methacrylate (PMMA)

PMMA selected for the present work is one of the most important polymeric materials with good physical properties.PMMA, an ethylene derivative, is a synthetic polymer made by the chain growth method of polymerization [7]. PMMA is a transparent [8], high-strength commercially available amorphous thermoplastic

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ARTICLE

Designing Cellulose Acetate - Polyacrylamide Semi-Interpenetrating Polymer Networks and Evaluation of their Protein Retention Behavior

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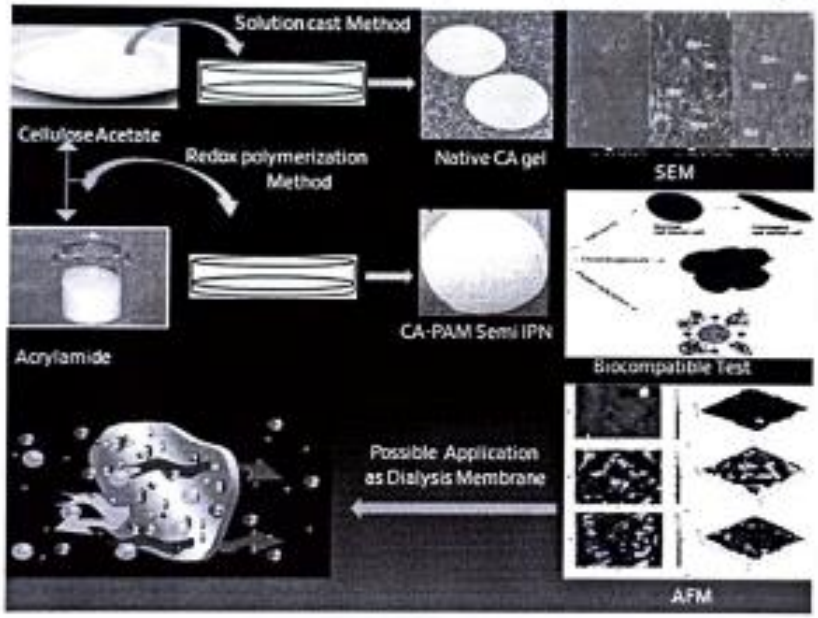
ABSTRACT

In this work semi-IPNs of cellulose acetate (CA) – N, N'- methylene bisacrylamide (MBA) – cross-linked polyacrylamide (PAML and native CA gel were prepared and characterized by FTIR, AFM, SEM, XRD, TGA and DSC techniques. The AFM studies revealed that addition of AM increased the symmetry of the semi-IPN surfaces whereas the XRD spectra suggested for a decrease in crystalline nature of CA. The network parameters were changed with change in concentrations of CA and AM. The prepared semi-IPNs were examined for retention of bovine serum albumin (BSA). The mechanical properties, swelling capacity, % porosity and biocompatibility were also investigated.

KEYWORDS

Dialysis; semi-IPNs; protein retention; SEM; FT-IR; swelling study



Introduction

IPNs are defined as a polymer network formed by the combination of two polymers, of which at least one is synthesized and/or crosslinked in the immediate presence of the other without forming any covalent bonds between them [1]. If one of the components of these IPNs has a linear structure instead of network, it is called semi-IPN. Semi IPNs have been employed in many industrial and biomedical fields because of their better mechanical strength, good compatibility and swelling tendency in water and biological fluids [2, 3].

In recent years, dialysis membranes have been investigated for their properties such as sieving ability [4], diffusive permeability, and pore size distribution [5, 6].

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Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/lpte.

Crystalline and Absorption Studies on Cadmium Sulphide doped Polycarbonate Composite

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Abstract. In this paper we have studied the preparation of composites of polycarbonate composite by incorporating Cadmium Sulphide(CdS) particles with different concentration. The prepared samples were characterized by the different techniques used like X-ray diffraction (XRD) techniques and UV-visspectroscopy(UV-Vis). The X-Ray diffraction technique gives the information on Crystallinity of the Sample, InterplanerDistance (d) and Crystallite Size (D). When the doping concentration is increased the crystallinity of the sample is increases and Crystallite size(D) is also increases. The UV-Vis spectroscopy technique gives information of Optical Band Gap. The energy band gap of pure polycarbonate is 4.437 eVand as we increase the concentration of cadmium sulphide the energy band gap decreases.

INTRODUCTION

Polycarbonate(PC) is an amorphous and polar thermoplastics polymer. It is used as engineering material because it has several properties such as transparency, dimensional stability, flame resistance, high heat distortion temperature and high impact strength[1]. Polycarbonate is soft in nature and the surface of polymer is easily stretched.It is used in electronic and electrical applications and has quite good insulation characteristics. Cadmium sulfide is an important II-IV group element semiconductor(at room temperature)with many excellent physical and chemical properties. This has promising application in multiple technical fields including photochemical catalysis, gas sensor, detectors for laser and infrared.

EXPERIMENTAL DETAILS

Material Used in Present Study

The polycarbonate with molecular weight 45.0Mw, from Company Acros Organics, New Jersey USA.Cadmium Sulphide(orange in colour), molecular weight 144.48 99% pure fromResearch Lab Fine Chemical Mumbai, India.

Preparation of Samples

The solvent cast technique was adopted for preparation of pure and composite samples. The specimen of pure PC, 0.2%CdS+PC, 0.4% CdS+PC, 0.6% CdS+PC, 0.8% CdS+PC, 1.0% CdS+PCin the presence of Chloroform as a solvent. The solution was constantly stirred with the help of electronics stirrer for 2hrs at room temperature and sonicated to obtained homogeneous solution. The prepared solution was poured on glass Petri disk. The film were kept at room temperature for overnight and then films were then removed from Petri disk and stored in air tight polyethylene begs for further characterization.

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A STUDY OF MOTIVATIONAL CHARACTERISTICS OF MALE AND FEMALE KABADDI PAYERS

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ABSTRACT

The purpose of the present study was to explore and compare the motivational characteristics of male and female kabaddi players representing their respective state in 65th Senior National Kabaddi Championships held at Hyderabad in the Year 2017-2018.Sports Motivation was assessed using Sports Motivation (SMS-6) scale constructed by Mollet et. Al. (2007) was used 240 national level kabaddi players were selected for the present study of which 120 were males and 120 were female players. The subject complete sports motivation scale to assess various factor of motivation i.e. A motivation, External Regulation, Interjected Regulation, Identified Regulation, Integration Regulation and Intrinsic Motivation. Results revealed that male kabaddi players were significantly more Interjected Regulation than females. Male kabaddi players also exhibit more external regulation. However, there was no significant difference between male and female but female kabaddi player achieved high mean scores in amotivation, identified regulation, integration regulation and intrinsic motivation which concludes that female are more intrinsic motivated than males in the group.

Keywords: Motivation, Male, Female, Kabaddi, National players

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फ़िजी में हिंदी पत्रकारिता और शांतिदूत समाचारपत्र

धरवेश कठेरिया[1], पीयूष प्रताप सिंह[2], प्रमोद पाण्डेय[3], अविनाश त्रिपाठी[4] & नीरज कुमार सिंह[5]

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Abstract

भारत में पत्रकारिता की शुरुआत 1780 में एक अंग्रेज़ जेम्स अगस्टस हिक्की के द्वारा की जाती है। हिक्की ने अंग्रेजी भाषा में भारत का पहला समाचारपत्र निकाला। इसके बाद भारत को हिंदी पत्र निकालने में लगभग पांच दशक लग गए। जिसके बाद भारत में उदन्त मार्तंड के के माध्यम से हिंदी पत्रकारिता का उदय होता है। वर्तमान में हिंदी पत्रकारिता का परचम केवल भारत में ही नहीं बल्कि विदेशों में भी हिंदी पत्रकारिता का परचम लहरा रहा है। भारत देश जब अंग्रेजों की दासता में था तब अंग्रेजों ने भारत से काम करने के लिए बहुत से मजदूरों को दूसरे देशों में भेजा। जहां बहुत से मजदूर स्थायी तौर पर बस गए और भारतीय संस्कृति के साथ भारतीय भाषा को भी उन देशों में स्थापित किया। ऐसे ही एक देश फ़िजी में हिंदी और हिंदी पत्रकारिता वहाँ के लोगों के जहां में बस गई है। लेकिन किसी भी दूसरे देश के लोगों का बसना और अपनी भाषा को स्थापित करना बहुत दुर्गम काम होता है। जिसमें फ़िजी के हिंदी समाचारपत्र शांतिदूत ने बहुत ही महत्वपूर्ण भूमिका निभाई। शांतिदूत समाचारपत्र लगभग आठ दशकों से फ़िजी में अनवरत प्रकाशित हो रहा है। इसने फ़िजी की हिंदी पत्रकारिता में एक नया आयाम जोड़ा और भारतीय भाषा के प्रचार-प्रसार में अप्रतिम योगदान दिया।

शब्द कुंजी: डायस्पोरा, फ़िजी, पत्रकारिता, समाचारपत्र, संस्कृति, गिरमिटिया, अध्ययन, भाषा।

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सोनी टीवी के थ्रिलर धारावाहिक 'बेहद' का समाज पर प्रभाव

धरवेश कठेरिया[1], पीयूष प्रताप सिंह[2], प्रमोद पाण्डेय[3], नीरज कुमार सिंह[4] & पदमा वर्मा[5]

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Abstract

धारावाहिक समाज का आईना होता है ऐसे में सवाल उठता है कि बेहद धारावाहिक समाज को कौन सा आईना दिखा रहा है? वह इतनी नकारात्मकता को क्यों परोस रहा है? धारावाहिक का प्रस्तुतीकरण वर्तमान में प्रसारित अन्य धारावाहिकों से हटकर है। धारावाहिक प्रस्तुतीकरण, कथानक, दृश्यांकन, लोकेशन और वस्त्र सज्जा आदि स्तरों पर दर्शक को प्रभावित करने में महत्वपूर्ण रूप में सफल हो रहा है। कथानक के रूप में प्रयोग किए जा रहे डायलॉग आम जीवन की पृष्ठभूमि और कहावतों को प्रस्तुत करते हैं जिन्हें दर्शकों द्वारा पसंद किया जा रहा है। सबसे बड़ी विशेषता इस धारावाहिक के कहानी की है। जिसमें गरीबी-अमीरी और प्यार के त्रिकोणीय प्रस्तुति में एक-दूसरे को हासिल करने की पृष्ठभूमि पर फिल्मांकन किया गया है। इस प्रस्तुतीकरण को एक विशेष दर्शक समूह द्वारा बेहद पसंद किया जा रहा है। एक विशेष समूह की पसंद क्या समाज के उन परिवर्तनों की ओर संकेत करती है जिनका प्रभाव समाज पर देखने को मिल रहा है। यह प्रभाव है जिसे हम समाज और संस्कृति पर विदेशी संस्कृति का हमला कह सकते हैं या सामाजिक परिवर्तन।

शब्द कुंजी: *अभियान, बेहद, थ्रिलर, खतरनाक, संस्कृति, सोनी टीवी।*